MIDTERM EXAMINATION

Spring 2009

MTH601- Operations Research

Time: 60 min

Marks: 40

Student Info	
Student ID:	
Center:	
Exam Date:	

For Teacher's Use Only									
Q No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Marks									
Q No.	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
Marks									
Q No.	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	
Marks									

Question No: 1 (Marks: 1) - Please choose one

EST and EFT of activities are calculated in

► Forward pass

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► Path does not effected

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_____ may be less than most likely time estimate

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If an activity consumes no time and no resources then this activity is called _____.

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Cost period = ------- × (No of ordered items)

► Holding cost

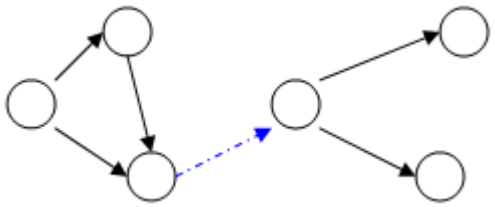
► Set up cost

► Stock out cost

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The following network is an example of



► Redundancy

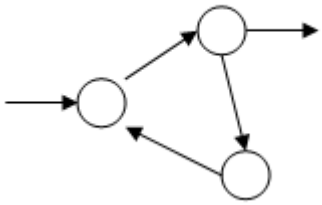
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- ► Redundancy
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Which one is best describe Micro Economic Planning?

- ► Distribution of fertilizer
- ► Improving the layout of a workshop in a company
- ► Investment planning of the country
- ► PERT

Question No: 9 (Marks: 1) - Please choose one

If $t_0 = 6$, $t_m = 12$ and $t_p = 18$, then V_t= _____

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Which inventory model also known as a saw tooth model?

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For backward pass computations

► Earliest start time $\geq$ Latest start time

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In a quadratic programming problem unlike linear programming problem

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A forward pass is used to determine and calculate the _____ dates, through utilization of a previously specified start date.

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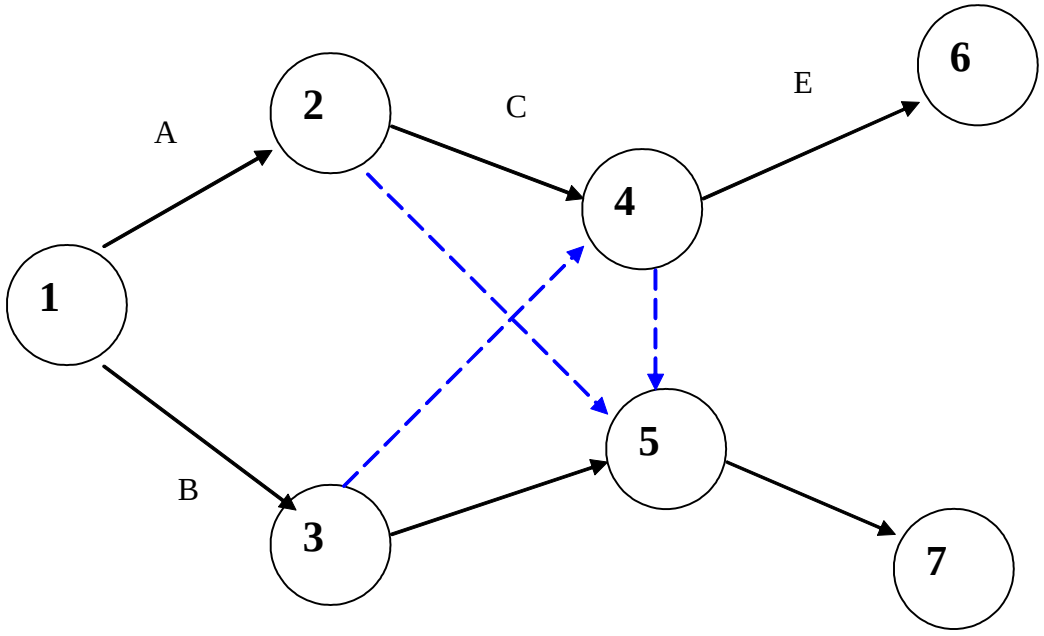
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Is this Network legal?



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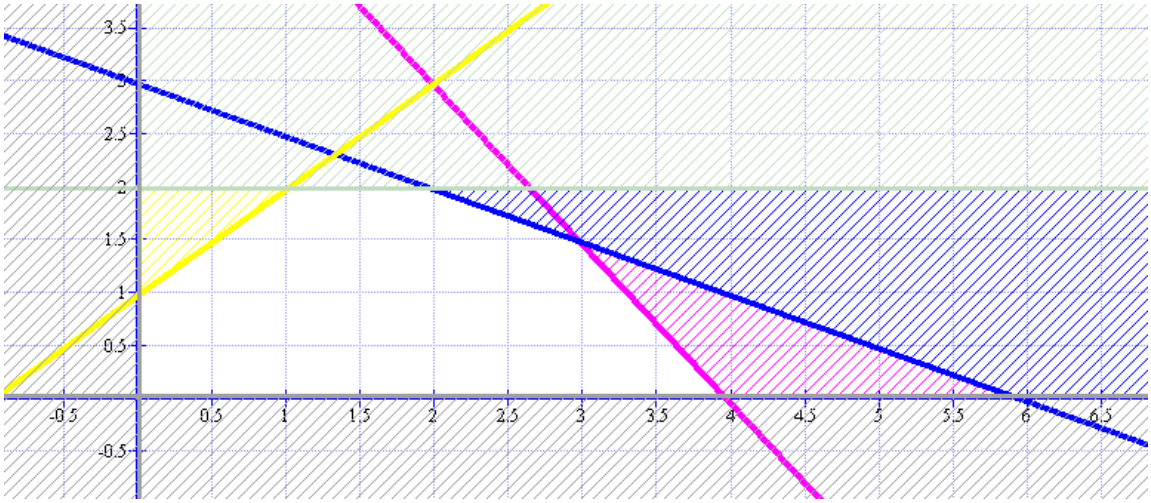
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Where K is called service factor.

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Question No: 21 (Marks: 2)



Using above graph, Write down the equation (Blue shaded area).

Question No: 22 (Marks: 3)

Draw a net work diagram for the following dependency relationship.
A controls F, G and H; B controls G and H with H controlled by C.

Question No: 23 (Marks: 5)

Draw the graph of the following constraints.

$$\begin{aligned} x &\le 4 \\ 2y &\le 12 \\ 2x+3y &\le 18 \\ x \ge 0, \quad y &\ge 0 \end{aligned}$$

Question No: 24 (Marks: 10)

Solve by Graphical method:
Shows corner points and optimize the objective function.

$$Max.Z = 5x_1 - 3x_2 + 10$$

Subject to :

$$\begin{aligned} 2x_1 - 3x_2 &\ge 6 \\ x_1 + 4x_2 &\le 10 \\ 2x_1 + 5x_2 &\ge 4 \\ x_1 \ge 0, \quad x_2 &\ge 0 \end{aligned}$$

Mth601_Operations Research

Midterm

Solved Papers....!!

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(c). Dynamic Programming
(d). None of the above

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(a). One sixth of the difference between pessimistic time estimates and optimistic time estimates

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? None of these.

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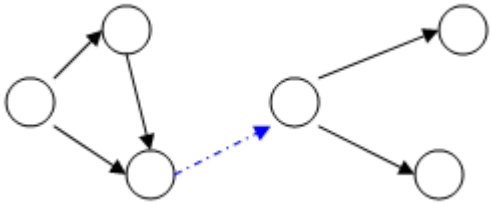
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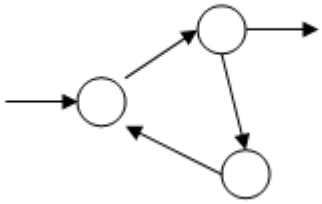
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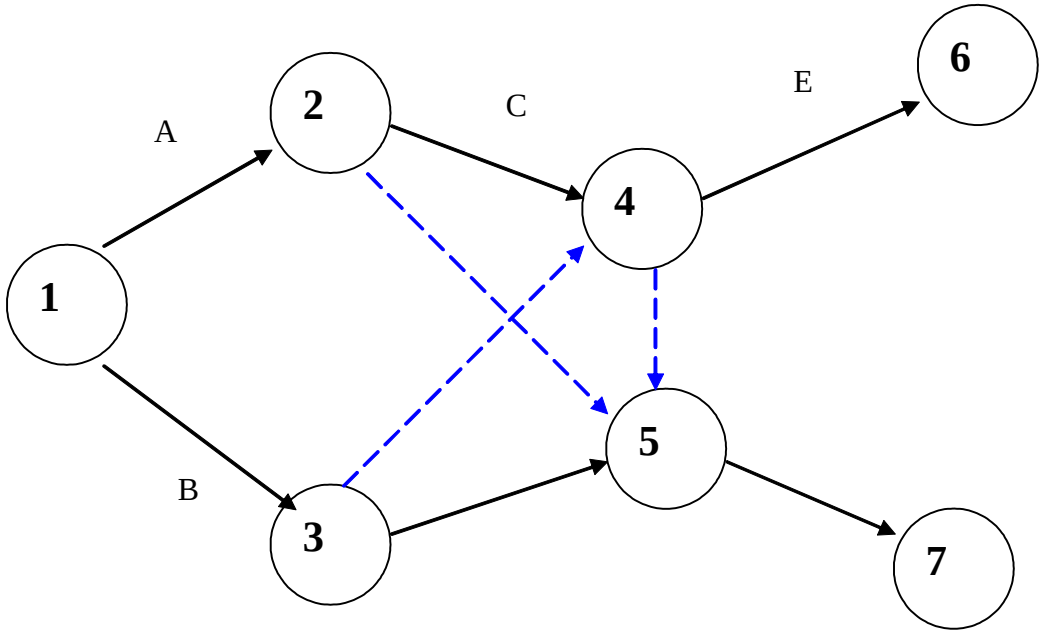
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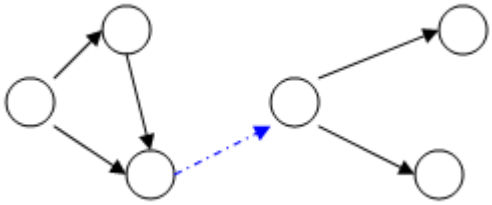
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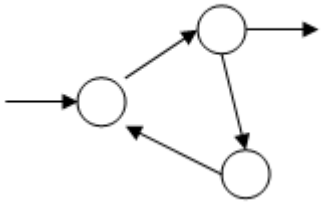
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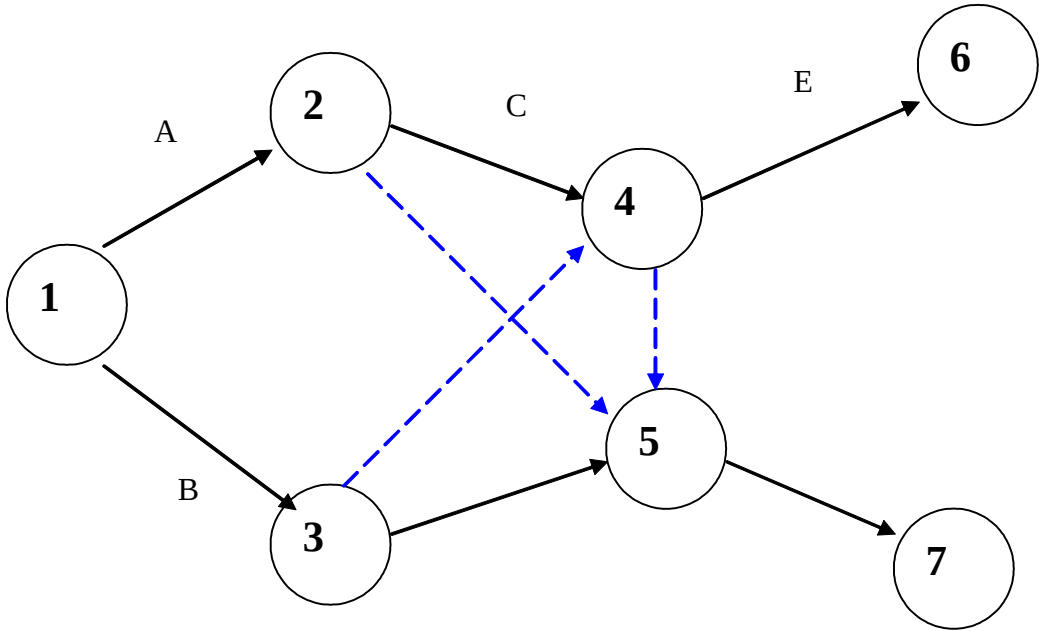
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MTH601 Quiz No. 02:

Question # 1 of 10 (Start time: 03:07:02 PM) Total Marks: 1
Which of the following is the meaning of 'Linear'?
Select correct option:
- ***Relationship between the variables is a straight line***
- *Relationship between the variables is a curvilinear*
- *Relationship between the variables is discrete line*
- *Relationship between the variables is finite or infinite*

Question # 2 of 10 (Start time: 03:08:09 PM) Total Marks: 1
Which of the following would be the objective of the revenue in a production of cell phones?
Select correct option:
- *Inflection*
- *Average*
- *Maximization*
- *Minimization*

Question # 3 of 10 (Start time: 03:09:41 PM) Total Marks: 1
In an optimization problem, we seek for maximizing or minimizing a specific quantity, called the ----------.
Select correct option:
- *decision variables*
- *constraints*
- *feasible solution*
- ***objective function***

Quiz Start Time: 03:07 PM
Time Left 87
sec(s)
Question # 4 of 10 (Start time: 03:10:50 PM) Total Marks: 1
For an industrialist, optimization means ----------.
Select correct option:
- *maximizing its profit only*
- *minimizing its cost only*
- *both maximizing its profit and minimizing its cost*
- ***change the business strategy and looking forward new customers (I think so)***

Quiz Start Time: 03:07 PM
Time Left 88
sec(s)

Question # 5 of 10 (Start time: 03:11:54 PM) Total Marks: 1
Which of the following correspond to the economic or physical quantities which are under the control of operations researcher while modeling a real life situation into a linear program?
Select correct option:
- *Objective function*
- *Constraints*
- *Decision variables*
- *Linear function*

Quiz Start Time: 03:07 PM
Time Left 88
sec(s)
Question # 6 of 10 (Start time: 03:12:49 PM) Total Marks: 1
Which of the following would be the objective of the yield per minute in a chemical process which depends upon the temperature 'x' and pressure 'y'?
Select correct option:
- *Maximization*
- *Minimization*
- *Inflection*
- *Average*

Quiz Start Time: 03:07 PM
Time Left 88
sec(s)
Question # 7 of 10 (Start time: 03:13:43 PM) Total Marks: 1
Which of the following correspond to the practical limitations of available resources while modeling a real life situation into a linear program?
Select correct option:
- ***Objective function***
- *Constraints*
- *Decision variables*
- *Linear function*

Quiz Start Time: 03:07 PM
Time Left 88
sec(s)
Question # 8 of 10 (Start time: 03:14:42 PM) Total Marks: 1
Under which of the following condition, a mathematical Program would be non-linear?
Select correct option:
- *If least Objective function is non-linear*
- ***If both Objective function and constraints are non-linear (Page 9)***

Quiz Start Time: 03:07 PM
Time Left 88
sec(s)

Question # 9 of 10 (Start time: 03:15:42 PM) Total Marks: 1
The word 'Linear' in Linear programming problem describes ---------- between two or more variables.
Select correct option:
- *that a Correlation exists*
- *a recurrence relation*
- ***a direct proportionate relation***
- *an inverse proportionate relation*

Quiz Start Time: 03:07 PM
Time Left 88
sec(s)
Question # 10 of 10 (Start time: 03:16:59 PM) Total Marks: 1
Solution of a Linear Programming problem is found by --------- methods.
Select correct option:
- *Analytical*
- *Probabilistic*
- *Iterative*
- ***Pure algebraic (Page 103)***

MTH601 Quiz No 1

Question # 1 of 10 (Start time: 11:05:44 AM) Total Marks: 1
Which of the following correspond to the practical limitations of available resources while modeling a real life situation into a linear program?

Select correct option:
- ***Objective function (Page 80)***
- *Constraints*
- *Decision variables*
- *Linear function*

Question # 2 of 10 (Start time: 11:07:06 AM) Total Marks: 1
In an optimization problem, we seek for maximizing or minimizing a specific quantity, called the ----------.
Select correct option:
- *decision variables*
- *constraints*
- *feasible solution*
- ***objective function (Page 80)***

Question # 3 of 10 (Start time: 11:08:39 AM) Total Marks: 1
While solving a problem by any of Linear Programming method, an objective function is to be ----------.
Select correct option:
- *maximized*
- ***minimized (page 142)***
- *optimized*
- *standardized*

Quiz Start Time: 11:05 AM
Time Left 87
sec(s)
Question # 4 of 10 (Start time: 11:10:36 AM) Total Marks: 1
Modeling of a Linear Programming problem from a real life world is a/an ------ .
Select correct option:
- ***art (Page 80)***
- *science*

engineering
technology

Question # 5 of 10 (Start time: 11:24:33 AM) Total Marks: 1
Which of the following is the major objective of the ABC analysis of inventory?
Select correct option:
To fulfill the demand of items
To replace the required items in proper time
To control the inventories
To classify the items in different categories (Page 71)

Quiz Start Time: 11:05 AM
Time Left 88
sec(s)
Question # 6 of 10 (Start time: 11:26:01 AM) Total Marks: 1
In a Linear Programming problem which of following condition is compulsory?
Select correct option:
Least Objective function needs to be linear (page 80)
Least constraints need to be linear
Both Objective function and constraints need to be linear
Neither objective nor constraints to be linear

Quiz Start Time: 11:05 AM
Time Left 87
sec(s)
Question # 7 of 10 (Start time: 11:27:03 AM) Total Marks: 1
Which of the following is first step to model a linear programming problem?
Select correct option:
Identifying the objective function (Page 80)
Identifying the non-negative constraints
Identifying the unknown decision variables
Identifying all the restrictions

Quiz Start Time: 11:05 AM
Time Left 87
sec(s)
Question # 8 of 10 (Start time: 11:28:09 AM) Total Marks: 1
The objective function and ---------- together form a Linear Programming problem.
Select correct option:
a set of constraints (Page 101)
unrestricted variables
feasible region
optimal solution

Question # 9 of 10 (Start time: 11:29:42 AM) Total Marks: 1
Which of the following is the meaning of 'Linear'?
Select correct option:

Relationship between the variables is a straight line
Relationship between the variables is a curvilinear
Relationship between the variables is discrete line
Relationship between the variables is finite or infinite

Quiz Start Time: 11:05 AM
Time Left 88
sec(s)
Question # 10 of 10 (Start time: 11:31:13 AM) Total Marks: 1
Which of the following would be the objective of the yield per minute in a chemical process which depends upon the temperature 'x' and pressure 'y'?
Select correct option:

Maximization
Minimization
Inflection
Average

Mine Latest Quizz
12:48am 19 May 2015

1_*In a project, a network diagram shows the ---------- relations of the inter related activities along with their corresponding activity times.*

precedence or succession
2_ *While finding the Critical Path, in the phase of Late Start and Late Finish, we start from last node and the computations are performed from -------- up to the beginning event.*
right to left

3_*About which of the following it is true that, "they only signify with the passage of time, the beginning and ending of some activities under no consumption of resources" ?*

dummy

4_*Which of the following event has no immediate successor in any network flow diagram?*
Critical Event (not sure)

5_*Which of the following phases are performed to find the critical path in CPM?*
Precedence and succession (not sure)

6_*Which of the following value is correct for the expected time of an activity having optimistic, pessimistic and most likely times as 4, 8 and 6 days respectively?*
9.33 days

7_*A/An ---------- is the collection of inter related activities to be performed in a particular sequence to completion.*
project

8_*While solving a network flow problem by using PERT, the area under the Normal Distribution curve gives ----------.*

9_*In the phase of Early Start and Early Finish, to find the Critical Path in a network flow diagram, for the first node(event), we start with time ----------.*
with strict positive value

10_*In a network flow diagram, two jobs (i,j) and (i,k) of '9'and '6' days duration leaves the node 'i' then which of the following will be Late start time for 'i', if it is provided that both (i,j) and (i,k) finish late on 12th and 8th day respectively?*

3rd day

MTH601 Quiz No 03:

Question # 1 of 10 (Start time: 03:07:02 PM) Total Marks: 1

Which of the following is the meaning of 'Linear'?

Select correct option:

Relationship between the variables is a straight line

Relationship between the variables is a curvilinear

Relationship between the variables is discrete line

Relationship between the variables is finite or infinite

Question # 2 of 10 (Start time: 03:08:09 PM) Total Marks: 1

Which of the following would be the objective of the revenue in a production of cell phones?

Select correct option:

Inflection

Average

Maximization

Minimization

Question # 3 of 10 (Start time: 03:09:41 PM) Total Marks: 1

In an optimization problem, we seek for maximizing or minimizing a specific quantity, called the ----------.

Select correct option:

decision variables

constraints

feasible solution

Objective function

Question # 4 of 10 (Start time: 03:10:50 PM) Total Marks: 1

For an industrialist, optimization means ----------.

Select correct option:

maximizing its profit only

minimizing its cost only

Both maximizing its profit and minimizing its cost

change the business strategy and looking forward new customers

Question # 5 of 10 (Start time: 03:11:54 PM) Total Marks: 1

Which of the following correspond to the economic or physical quantities which are under the control of operations researcher while modeling a real life situation into a linear program?

Select correct option:

Objective function

Constraints

Decision variables

Linear function

Question # 6 of 10 (Start time: 03:12:49 PM) Total Marks: 1

Which of the following would be the objective of the yield per minute in a chemical process which depends upon the temperature 'x' and pressure 'y'?

Select correct option:

Maximization

Minimization

Inflection

Average

Question # 7 of 10 (Start time: 03:13:43 PM) Total Marks: 1

Which of the following correspond to the practical limitations of available resources while modeling a real life situation into a linear program?

Select correct option:

Objective function

Constraints

Decision variables

Linear function

Question # 8 of 10 (Start time: 03:14:42 PM) Total Marks: 1

Under which of the following condition, a mathematical Program would be non-linear?

Select correct option:

If least Objective function is non-linear

If both Objective function and constraints are non-linear

Question # 9 of 10 (Start time: 03:15:42 PM) Total Marks: 1

The word 'Linear' in Linear programming problem describes ---------- between two or more variables.

Select correct option:

that a Correlation exists

a recurrence relation

a direct proportionate relation

an inverse proportionate relation

Question # 10 of 10 (Start time: 03:16:59 PM) Total Marks: 1

Solution of a Linear Programming problem is found by --------- methods.

Select correct option:

Analytical

Probabilistic

Iterative

Pure algebraic

Question # 1 of 10 (Start time: 11:05:44 AM) Total Marks: 1

Which of the following correspond to the practical limitations of available resources while modeling a real life situation into a linear program?

Select correct option:

Objective function

Constraints

Decision variables

Linear function

Question # 2 of 10 (Start time: 11:07:06 AM) Total Marks: 1

In an optimization problem, we seek for maximizing or minimizing a specific quantity, called the ----------.

Select correct option:

Decision variables

constraints

feasible solution

objective function

Question # 3 of 10 (Start time: 11:08:39 AM) Total Marks: 1

While solving a problem by any of Linear Programming method, an objective function is to be ----------.

Select correct option:

maximized

minimized

Optimized

standardized

Question # 4 of 10 (Start time: 11:10:36 AM) Total Marks: 1

Modeling of a Linear Programming problem from a real life world is a/an ------ .

Select correct option:

Art

science

engineering

technology

Question # 5 of 10 (Start time: 11:24:33 AM) Total Marks: 1

Which of the following is the major objective of the ABC analysis of inventory?

Select correct option:

To fulfill the demand of items

To replace the required items in proper time

To control the inventories

To classify the items in different categories

Question # 6 of 10 (Start time: 11:26:01 AM) Total Marks: 1

In a Linear Programming problem which of following condition is compulsory?

Select correct option:

Least Objective function needs to be linear

Least constraints need to be linear

Both Objective function and constraints need to be linear

Neither objective nor constraints to be linear

Question # 7 of 10 (Start time: 11:27:03 AM) Total Marks: 1

Which of the following is first step to model a linear programming problem?

Select correct option:

Identifying the objective function

Identifying the non-negative constraints

Identifying the unknown decision variables

Identifying all the restrictions

Question # 8 of 10 (Start time: 11:28:09 AM) Total Marks: 1

The objective function and ---------- together form a Linear Programming problem.

Select correct option:

a set of constraints

unrestricted variables

feasible region

optimal solution

Question # 9 of 10 (Start time: 11:29:42 AM) Total Marks: 1

Which of the following is the meaning of 'Linear'?

Select correct option:

Relationship between the variables is a straight line

Relationship between the variables is a curvilinear

Relationship between the variables is discrete line

Relationship between the variables is finite or infinite

Question # 10 of 10 (Start time: 11:31:13 AM) Total Marks: 1

Which of the following would be the objective of the yield per minute in a chemical process which depends upon the temperature 'x' and pressure 'y'?

Select correct option:

Maximization

Minimization

Inflection

Average

MTH601 Solved Midter MCQS File

1. _____ employs a different modeling and solution logic than linear programming
(a). Transportation Model
(b). Inventory Control Model
(c). Dynamic Programming
(d). None of the above

2. To identify and maintain the proper precedence relationship between activities those are not connected by event, we introduce
(a). Parallel Activity
(b). Dummy Activity
(c). Sequential Activity
(d). None of the above

3. EST and EFT of activities are calculated in
(a). Forward pass
(b). Backward pass

4. Critical path is obtained by connecting the jobs having
(a). Activities having same EST and LST
(b). Activities having same EFT and LFT
(c). Activities having zero slack
(d). All of the above

5. The Variance Vt of expected time is calculated as
(a). $V_t = (\frac{t_m - t_0}{6})^2$
(b). $V_t = (\frac{t_0 - t_p}{6})^2$
(c). $V_t = (\frac{t_p - t_m}{6})^2$
(d). None of the above

6. In LP problems Additivity means that
(a). The effect of two different programs of production is the same as that of a joint program
(b). The doubling (or tripling) the product will exactly double (or triple) the profit and the required
resource
(c). Both (a)& (b)
(d). None of the above

7. Two of the first steps of OR process encompass the actual use of OR techniques. These steps are
(a). Model Construction and Model Solution

(b). Observation and Implementation
(c). Definition of the problem and Model Solution
(d). Model Solution and Implementation of results

8. Let FS = Free Slack, TS = Total Slack, INDS = Independent Slack, then which relation is true
(a). TS $\leq$ FS
(b). INDS $\leq$ FS
(c). FS $\leq$ TS
(d). Both (b) & (c)

9. Best possible time estimate that a given activity would take under normal conditions which often exist, is called
(a). Most Likely time estimate
(b). Pessimistic time estimate
(c). Smallest time estimate
(d). None of the above

10. Standard Deviation S.D is
(a). One sixth of the difference between pessimistic time estimates and optimistic time estimates
(b). One sixth of the difference between pessimistic time estimates and most likely time estimates
(c). One sixth of the difference between optimistic time estimates and most likely time estimates (d). One sixth of the difference between most likely time estimates and optimistic time estimates

Which one is best describe Sectoral planning

? Inventory Planning in agriculture

? Improving the layout of a workshop in a company

? Simulation Modeling of the Economy of the country

? None of these.

_____ is the most appropriate to situations where we maintain a relative stable employment levels and utilize the resource at a more constant rate

? (a). Resource Leveling Program

? (b). Resource Allocation Program

? (c). Both a & b

? (d). None of these.

If the slack time is zero, it means that the project will be

? Delayed

? Completed on schedule

The amount of an activity can be delayed without affecting the early start time of any other job, is called

? Free Slack

? Independent Slack

? Total Slack

? None of these.

Question No: 1 (Marks: 1) - Please choose one

EST and EFT of activities are calculated in

► **Forward pass**

► Backward pass

► Path does not effected

Question No: 2 (Marks: 1) - Please choose one

_____ may be less than most likely time estimate

► **Pessimistic time estimate**

► Smallest time estimate

► Optimistic Time estimate

Question No: 3 (Marks: 1) - Please choose one

The dummy activities consume

► **No time, no resources**

► No time but some resources

► Some resources in minimum time

► None of these

Question No: 4 (Marks: 1) - Please choose one

If an activity consumes no time and no resources then this activity is called _____.

► **dummy activity**

► sequential activity

► critical activity

► cyclic activity

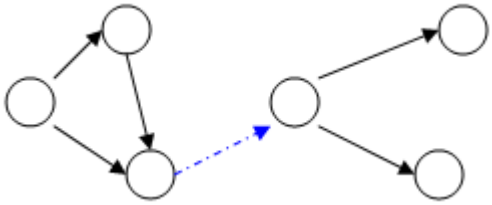
Question No: 5 (Marks: 1) - Please choose one

Cost period = ------- × (No of ordered items)

- ► Holding cost
- ► Set up cost
- ► Stock out cost
- ► **Item cost**

Question No: 6 (Marks: 1) - Please choose one

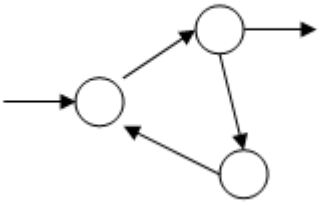
The following network is an example of



- ► Redundancy
- ► Cycling
- ► Looping
- ► **Merging**

Question No: 7 (Marks: 1) - Please choose one

The following network is an example of



- ► **Redundancy**

- Dangling
- Cycling
- Dummy

Question No: 8 (Marks: 1) - Please choose one

Which one is best describe Micro Economic Planning?

- Distribution of fertilizer
- **Improving the layout of a workshop in a company**
- Investment planning of the country
- PERT

Question No: 9 (Marks: 1) - Please choose one

If $t_0 = 6$, $t_m = 12$ and $t_p = 18$, then V_t= _____

- 12
- 2
- **4**
- 144

Question No: 10 (Marks: 1) - Please choose one

Which inventory model also known as a saw tooth model?

- **Purchasing Model with no shortages**
- Purchasing Model with shortages
- Manufacturing Model with no shortages
- Manufacturing Model with shortages

Question No: 11 (Marks: 1) - Please choose one

For backward pass computations

- Earliest start time $\geq$ Latest start time
- Earliest start time $\leq$ Latest start time
- Earliest start time $+$ Latest start time = 0
- Earliest start time $=$ Latest start time

Question No: 12 (Marks: 1) - Please choose one

For an activity if optimistic time, most likely time estimate and pessimistic time estimate are **3, 6** and **15** respectively then expected time is

- 4
- 3
- **7**
- 20

Question No: 13 (Marks: 1) - Please choose one

In a quadratic programming problem unlike linear programming problem

- ► Only objective function is quadratic
- ► Both objective function and constraints are quadratic
- ► Only constraints are quadratic
- ► At least one of objective function or constraint must be quadratic

Question No: 14 (Marks: 1) - Please choose one

Solution region of the constraint $x \geq 0$ is

- ► Half plane to the right of straight line $x = 0$
- ► Half plane to the right of y-axis
- ► Half plane to the region where abscissas are non-negative
- ► All are equivalent

Question No: 15 (Marks: 1) - Please choose one

A dummy activity is a simulated activity of sorts, one that is of _____duration and is created for the sole purpose of demonstrating a specific relationship and path of action on the arrow diagramming method.

- ► Zero
- ► Minimum
- ► Maximum
- ► Average

Question No: 16 (Marks: 1) - Please choose one

Activity definition refers to the process of parsing a project into a number of individual tasks which must be completed _____ the deliverables can be considered completed. Activity definitions rely on a number of specific input processes.

- **before**
- both before and after
- after

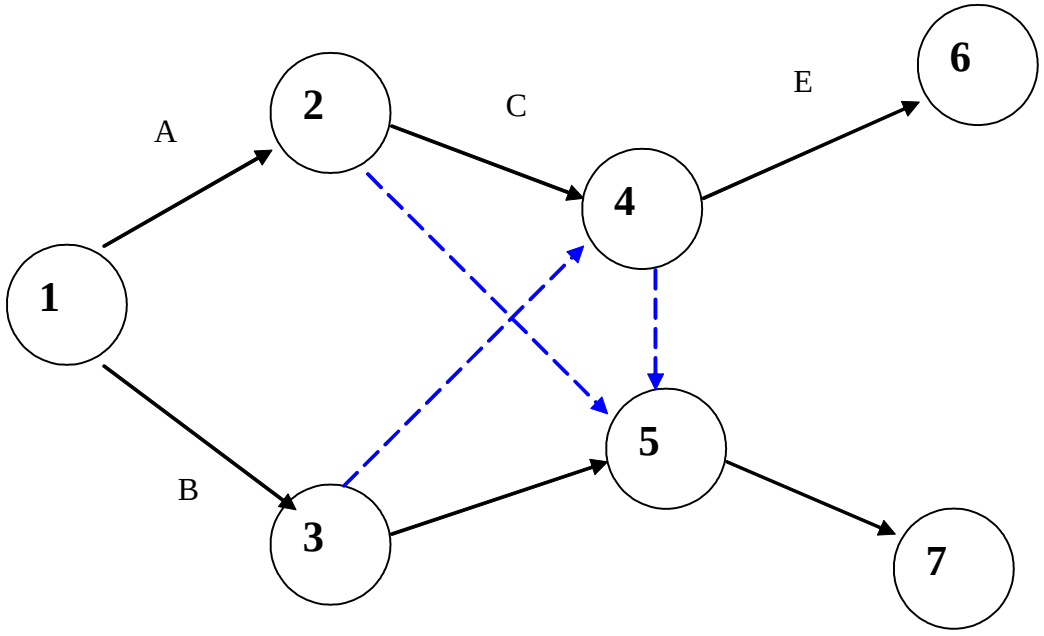
Question No: 17 (Marks: 1) - Please choose one

A forward pass is used to determine and calculate the _____ dates, through utilization of a previously specified start date.

- **early start and early finish**
- late start and early finish
- early start and late finish
- late start and late finish

Question No: 18 (Marks: 1) - Please choose one

Is this Network legal?



- Yes.
- **No.**

Question No: 19 (Marks: 1) - Please choose one

Total cost per period = Item cost + Order cost + Holding cost + _____.

- Shortage cost
- Optimum Shortage (S*)
- Economic Oreder Quantity. (Q*)
- Maximum Inventory. ($I_{max.}$)

Question No: 20 (Marks: 1) - Please choose one

$K = Z \times (---)$

Where K is called service factor.

- $\sqrt{\pi/2}$
- $\sqrt{2/\pi}$
- $\sqrt{2\pi/3}$
- $\sqrt{3\pi/2}$

MTH601-Midterm (June 7, 2014)

Question: (2 marks)
What is linear Programming?

Question: Forgot ☹

Question: (3 marks)
If we increase the inventory, then what would be the proportionate effect on the followings? Give proper reason in each case.
(i) Shortage Cost.
(ii) Ordering or Setup Cost per unit time.
(iii) Holding Cost.

Question: (3 marks)
Put the following program in standard form

$$\textit{Maximize. } Z = x + y$$

$$\textit{Subject to}:$$

$$x + 5y \leq 5$$

$$2x + y \leq 4$$

$$x, y \geq 0$$

Question:
Find the initial basic feasible solution to the following linear programming problem,
Maximize $\boldsymbol{Z} = 4\boldsymbol{x} + \boldsymbol{y}$
Subject to
$3\boldsymbol{x} + \boldsymbol{y} = 3$
$2\boldsymbol{x} + \boldsymbol{y} \geq 6$
$\boldsymbol{x} + 2\boldsymbol{y} \leq 3$
$\boldsymbol{x}, \boldsymbol{y} \geq 0$

Question: (5 marks)
Classify the following material items into ABC categories.

Item Number	1	2	3	4	5	6	7
Annual Usage in Rs.	36000	14000	75000	37000	11000	16000	32000

Mth601 30 July 2013 final term paper:

2 marks qs
Q: ek bohat sari activities wali diagram di hui thi or qs ye tha
Find EFT for each activity?
Q:

0 5	2	1 1	6
2	1 5	5 2	7
2	4	3 7	7
5	5	10	

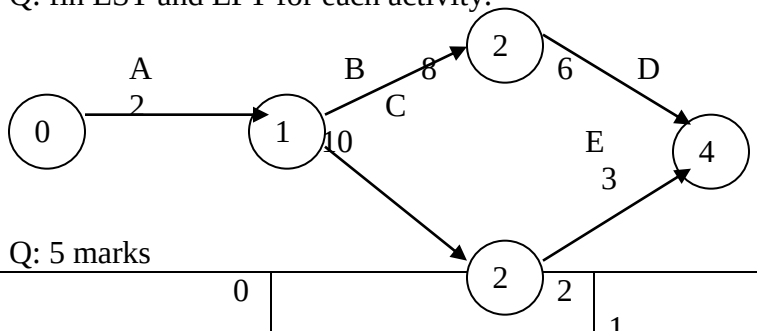
To find optimality condition we use UV multiplier process
Find

a) U_2+V_2
b) U_3+V_3

Q: 3 ya 5 mark ka tha ye qs
Contractor side wali values yad nai…

Building:	Contractor:
A	
B	
C	
D	

Operate first step by optimizing row wise the above assignment model.
Q: state principal of optimality (optimal policy) for dynamic programming?
Q: fin EST and EFT for each activity.



Q: 5 marks

0 5	2	1 1	6
2	1 5	5 2	7

2	4	3 7	7
5	5	10	

Find

a) P_{31}

b) P_{32}

Using $P_{ij} = U_i + V_j - C_{ij}$ suppose $U_1 = 0$ and $U_2 = 5$

Q: ek statement thi us me se Average Queuing length find krna thi.

Q: Minimizing setup times, which are given? (5 marks)

Job ki values yad nai

	Job 1	**Job2**	**Job3**	**Job4**
Machine 1	14	5	7	
Machine 2				
Machine 3				
Machine 4				

Q: ek 5 mark ka qs itna long tha k word pe paste krne se ek se zyada page ki just statement thi….

Plz pray for me……..

FINALTERM EXAMINATION
Fall 2012
MTH601 - Operations Research

Ref No: 3886822
Time: 120 min
Marks: 80

Student Info	
StudentID:	**BC090200xxx**
Center:	**PLHR02**
ExamDate:	**Thu, Feb 28, 2013**

For Teacher's Use Only

Q No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Marks	**0.0**	**1.0**	**0.0**	**1.0**	**1.0**	**0.0**	**0.0**	**0.0**	
Q No.	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
Marks	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	
Q No.	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	
Marks	**1.0**	**0.0**	**0.0**	**NA**	**1.0**	**0.0**	**0.0**	**0.0**	
Q No.	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	
Marks	**1.0**	**1.0**	**0.0**	**0.0**	**1.0**	**1.0**	**0.0**	**1.0**	
Q No.	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	
Marks	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**	
Q No.	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	
Marks	**NA**	**NA**	**2.0**	**NA**	**0.8**	**0.8**	**0.2**	**0.3**	
Q No.	**49**	**50**	**51**	**52**					
Marks	**1.0**	**2.0**	**0.8**	**0.0**					**19.9**

Question No: 1 (Marks: 1) - Please choose one

Which of the following is a characteristic of critical path scheduling techniques?

► The jobs or tasks are dependent on each other

► Interruptions may be permitted if they are documented

Selected answer The jobs or tasks must be well defined, and their completion marks the end of the project

► The jobs or tasks do not necessarily have to be in a predetermined sequence

Question No: 2 (Marks: 1) - Please choose one

During a replacement if the value of money decreases at the rate of **3**% then the present worth factor of unit amount to be spent after one year is given by

► 0.25

► 0.333

Selected answer 0.9708

► 4

Question No: 3 (Marks: 1) - Please choose one

If the money carries a rate of interest of **12**% per year, the present worth factor of one rupee due in one year is

Selected answer 0.08333

► 0.89285

► 0.0769

► 13

Question No: 4 (Marks: 1) - Please choose one

Search and cutting methods are used to solve following types of problems

► Transportation

► Assignment

Selected answer Integer Programming

► Queuing problems

Question No: 5 (Marks: 1) - Please choose one

A feasible solution is called a _____ solution if the number of non negative allocation is equal to "m + n – 1" (Here m is the number of rows, n is the number of columns in transportation problem)

Selected answer basic feasible

- ► non basic feasible
- ► basic infeasible
- ► optimal

Question No: 6 (Marks: 1) - Please choose one

If a basic feasible solution contains less than "m + n – 1" (Here m is the number of rows, n is the number of columns in transportation problem) non negative allocation, then it is said to be

- ► Degenerate
- ► Multiple Solutions
- ► Non degenerate

Selected answer Alternative Optima

Question No: 7 (Marks: 1) - Please choose one

Consider the following cost table

		Destinations			
Source		**D1**	**D2**	**D3**	**Supply**
	S1	5	1	2	**25**
	S2	7	2	4	**10**
	S3	3	3	5	**15**
	Demand	**10**	**20**	**20**	

Using Vogel's Approximation Method, which one is the starting cell?

Selected answer S1 à D1

- ► S3 à D1
- ► S2 à D2
- ► S2 à D1

Question No: 8 (Marks: 1) - Please choose one

		Destinations			
		D1	D2	D3	Supply
Source	S1	5	1	2	25
	S2	7	2	4	10
	S3	3 10	3	5	15
	Demand	10	20	20	

Using Vogel's Approximation Method:
These below are the three cells which can be next cell:

I. S3 → D2
II. S2 → D2
III. S1 → D3

Which one is the correct option?

► I, II and III
► I only
► II only

Selected answer III only

► I and II only

Question No: 9 (Marks: 1) - Please choose one

	D1	D2	D3	Supply
S1	5 10	1 15	2	25
S2	7	2 5	4 5	10
S3	3	3	5 15	15
Demand	10	20	20	

Cost = 10 (5) + 15 (1) + 5 (2) + 5 (4) + 15 (5) = 170

This is the initial basic feasible solution of a question by North – West Corner Method.

Finding optimal basic feasible solution: Consider U1 = 0 and V1 = 5, what is the value of V2?

- ►
- ►
- ►

Selected answer

Question No: 10 (Marks: 1) - Please choose one

Transportation problem is a special class of linear programming problem in which transport a commodity from the source to a destination in such a way that the total transportation cost is

- ► Zero
- ► Maximum

Selected answer Minimum

- ► Average

Question No: 11 (Marks: 1) - Please choose one

We solve a assignment problem by subtracting least number in each row and we get the table below:

Cost Table	Dist Center D	Dist Center E
Plant A	0	135
Plant B	0	8
Plant C	34	0

After doing next step, which table should be next?

Cost Table	Dist Center D	Dist Center E
Plant A	0	135
Plant B	0	8
Plant C	34	0

▶

Cost Table	Dist Center D	Dist Center E
Plant A	0	127
Plant B	0	0
Plant C	0	0

▶

Cost Table	Dist Center D	Dist Center E
Plant A	135	0
Plant B	8	0
Plant C	0	34

►

Cost Table	Dist Center D	Dist Center E
Plant A	0	0
Plant B	34	8
Plant C	0	135

Selected answer

Question No: 12 (Marks: 1) - Please choose one

The cost matrix in assignment problem is always
Selected answer identity matrix

► zero matrix
► diagonal matrix
► square matrix

Question No: 13 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then the average system time is:

► 1/5
Selected answer 5

► 1
► 2

Question No: 14 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then ρ (traffic intensity or system utilization) =?

► □□□

Selected answer □□□

► □□□
► □□□

Question No: 15 (Marks: 1) - Please choose one

Formula for the expected number in the system L is:

$$L=\frac{\lambda}{\mu-\lambda}$$

►

$$L=\frac{\lambda}{\mu+\lambda}$$

►

$$L=\frac{\lambda}{\lambda-\mu}$$

►

$$L=\frac{\mu}{\mu-\lambda}$$

Selected answer

Question No: 16 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then the expected number in the queue or average queue length is:

► □□□

Selected answer □

► □
► □□□

Question No: 17 (Marks: 1) - Please choose one

Total cost per period = Item cost + Order cost + Holding cost + _____.

Selected answer Shortage cost

- ► Optimum Shortage (S*)
- ► Economic Oreder Quantity. (Q*)
- ► Maximum Inventory. ($I_{max.}$)

Question No: 18 (Marks: 1) - Please choose one

In Manufacturing Model with no shortage, the replacement rate is finite and _____ the demand rate.

- ► greater than

Selected answer less than

- ► equal to

Question No: 19 (Marks: 1) - Please choose one

If "N*i*" be the Number of replacement made at the end of the i^{th} week and "P*j*" be the probability of failure during the i^{th} week, then N_1 = ----------.

- ► N_0P_1

Selected answer N_1P_1

- ► N_0P_0
- ► N_1P_2

Question No: 20 (Marks: 1) - Please choose one

If "N*i*" be the Number of replacement made at the end of the i^{th} week and "P*j*" be the probability of failure during the i^{th} week, then N_2 = ----------.

- ► $N_1P_2 + N_1P_1$
- ► $N_0P_2 + N_1P_1$
- ► $N_0P_1 + N_1P_2$
- ► $N_0P_2 + N_1P_2$

Question No: 21 (Marks: 1) - Please choose one

The present worth of a rupee to be spent after a year is denoted by *v* and given by

- ► $v = (1 + r)$
- ► $v = (1 / r)$
- ► $v = (1 + r) / 10$

Selected answer $v = 1/ (1 + r)$

Question No: 22 (Marks: 1) - Please choose one

Formula for a geometric series "$x + vx + v^2x + ... + v^{n-1}x$" is

$$P(n) = \frac{1-v^n}{1-v}$$

Selected answer

$$P(n) = x\frac{1-v}{1-v^n}$$

▶

$$P(n) = \frac{1-v}{1-v^n}$$

▶

$$P(n) = x\ \frac{1-v^n}{1-v}$$

▶

Question No: 23 (Marks: 1) - Please choose one

In replacement Models, Capital Cost = (Item / Machine Cots) – (----------).

▶ Resale Cost

▶ Running Cost

Selected answer Maintenance Cost

▶ Operating Cost

Question No: 24 (Marks: 1) - Please choose one

Formula of EOQ in manufacturing model with shortages is

$$Q^* = \sqrt{2C_2D/C_3(1-D/R)}.\sqrt{C_3+C_4/C_4}$$

▶

$$Q^* = \sqrt{2C_2D/C_3}.\sqrt{R/R-D}$$

Selected answer

$$Q^* = \sqrt{2C_2D/C_3}$$

▶

▶ Non of them

Question No: 25 (Marks: 1) - Please choose one

To identify and maintain the proper precedence relationship between activities those are not connected by event, we introduce

- ▶ Parallel Activity

Selected answer Dummy Activity

- ▶ Sequential Activity
- ▶ None of these

Question No: 26 (Marks: 1) - Please choose one

PERT is based on

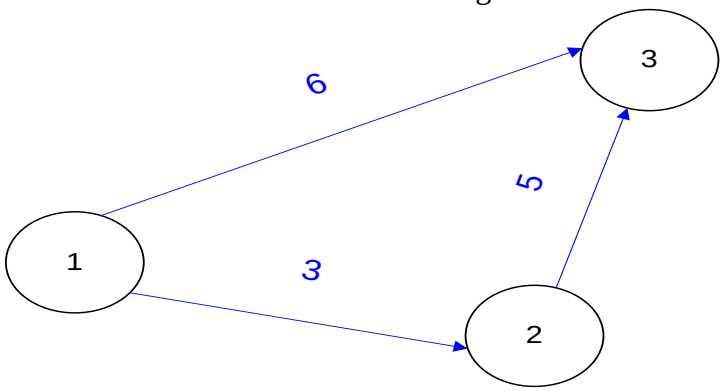
- ▶ Deterministic times

Selected answer Probabilistic Times

- ▶ Dummy Times
- ▶ Estimated times

Question No: 27 (Marks: 1) - Please choose one

Non-critical activities in the following network are -------



- ▶ Activity (1,2)
- ▶ Activity (2,3)

Selected answer Dummy Actvity

- ▶ Activity (1,3)

Question No: 28 (Marks: 1) - Please choose one

If $t_0 = 10$, $t_m = 10$ and $t_p = 16$, then *S.D* = _____.

- ▶ □□

► □□□
► □
Selected answer □□

Question No: 29 (Marks: 1) - Please choose one

Which of the following is an essential characteristic of a linear programming problem?

► The relationship between variables and constraints must be linear
► The model must have an objective function
► The model must have structural constraints
Selected answer All are equivalent

Question No: 30 (Marks: 1) - Please choose one

In the simplex table for a linear programming problem, we select the leaving basic variable corresponds to ----------
► Maximum non-negative ratio
► Maximum negative ratio
Selected answer Minimum non-negative ratio
► Minimum negative ratio

Question No: 31 (Marks: 1) - Please choose one

A technique for solving a linear programming problems in which artificial variables are included with coefficients of very large number say equal 10 times of any cost coefficient of decision variables is known as ---------
► Big M – Method.
► Least Cost Method
□□□□□□□□□□□□□□□□□□□□Hungarian Method
□□□□□□□►□Branch and Bound Method

Question No: 32 (Marks: 1) - Please choose one

If the _____ variables appear in the final basic set, then the LP (Linear Program) has no solution.
► slack
► surplus
► non – basic
Selected answer artificial

Question No: 33 (Marks: 1) - Please choose one

If no _____ variable appears in the basis and the optimality conditions are satisfied, then the current solution will be optimal one.

► artificial

Selected answer non basic

► slack

► surplus

Question No: 34 (Marks: 1) - Please choose one

Min. Z = 0 and no artificial variable appears in the basic variables. _____ solution to original problem has been found and we proceed to phase II method.

► A basic feasible

► An optimal

Selected answer An infeasible

Question No: 35 (Marks: 1) - Please choose one

In Two – Phase method, if all the _____ variables become zero, we stop the phase I and proceed to phase-II.

► artificial

Selected answer basic

► non basic

► positive slack

► negative slack

Question No: 36 (Marks: 1) - Please choose one

The inequality $2x+3y\leq 18$ is equivalent to

► $2x+3y\leq -18$

Selected answer $-2x-3y\geq 18$

► $-2x-3y\geq -18$

► $-2x-3y\leq -18$

Question No: 37 (Marks: 1) - Please choose one

Which of the following order pair would minimize the objective function of the linear programming problem; $z = x + y$ subject to $x \geq 3$, $y \geq 0$?

► (3,3)
Selected answer (3,0)
► (0,3)
► (0,0)

Question No: 38 (Marks: 1) - Please choose one

In which of the following models, Simplex algorithm is not preferred to use due to laborious computations?

► Transportations models
► Degenerate Linear models
► Non-degenerate Linear models
Selected answer Dual or unbounded linear models

Question No: 39 (Marks: 1) - Please choose one

Transportations models consist of ------- like the production centers and --------- which may be the sales centers.

► (sinks, sources)
► (sources, sinks)
Selected answer (origins, sources)
► (sinks, destinations)

Question No: 40 (Marks: 1) - Please choose one

To convert the transportation problem into a maximization model we have to----------.

► write the inverse of the coefficient matrix

► multiply the feasibility condition by –1
► multiply the coefficient matrix by –1

Selected answer We can't convert the transportation problem into a maximization problem, as it is basically a minimization problem.

Question No: 41 (Marks: 2)

A branch of Punjab National Bank has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8 – hour worki9ng day. If the typewriter is valued at Rs. 1.50 per hour, Determine

Average system time.

Answer

Not Attempted

Question No: 42 (Marks: 2)

An oil company has 8 unit of money available for exploration of three sites. If oil is present at a site, the probability of finding it depends upon the amount allocated for exploiting the site as given below:

	0	1	2	3	4	5	6	7	8
Site I	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.0
Site II	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.8	1.0
Site III	0.0	0.1	0.1	0.2	0.3	0.5	0.8	0.9	1.0

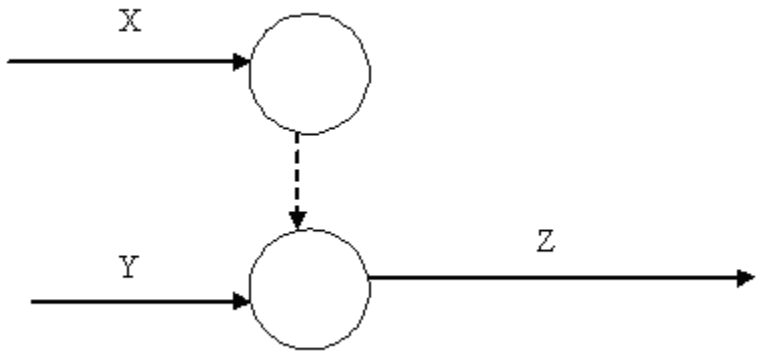
The probability that the oil exits at sites I, II and III is 0.4, 0.3 and 0.2 respectively; we have to find the optimal allocating of money.

Do stage I only.

Answer

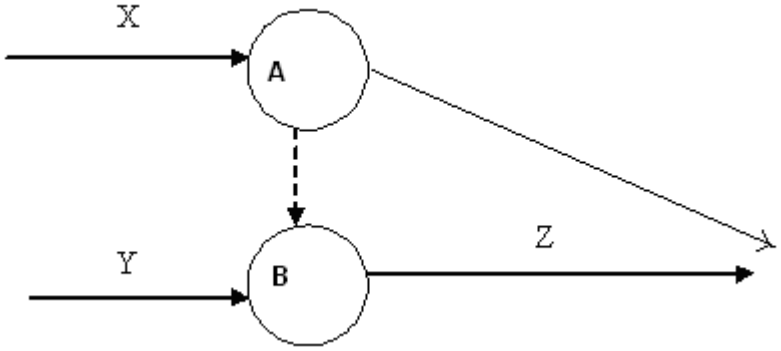
Not Attempted

Question No: 43 (Marks: 2)



Write the relationship between the activities.

Answer



X approches to Y
X also approches to Z
Y approches to Z
whether A and b might have the values between the centre points

Question No: 44 (Marks: 2)

For the mathematical form of a Transportation problem(T.P):

$$\min z = \sum_{i=1}^{i=m} \sum_{j=1}^{j=n} c_{ij} x_{ij} \text{ ------(1)}$$

subject to

$$\sum_{j=1}^{j=n} x_{ij} = a_i \text{ -----(2)} \ , i = 1, 2, \ldots, m(\text{Sources})$$

$$\sum_{i=1}^{i=m} x_{ij} = b_j \text{ -----(3)} \ , i = 1, 2, \ldots, n(\text{Destinations})$$

Describe the practical significance of all the above equations(1), (2) and (3).

Answer

Not Attempted

Question No: 45 (Marks: 3)

The milk plant at a city distributes its products by trucks, located at the loading dock. It has its own fleet of trucks plus trucks of a private transport company. This transport company has complained that sometimes its trucks have to wait in line and thus the company loses money paid for a truck and driver that is only waiting. The company has asked the milk plant management either to go in for a second loading dock or discount prices equivalent to the waiting time, the following data available

$$\lambda = Average\, arrival\, rate = 3\ per\ hour$$
$$\mu = Average\, service\, rate = 4\ per\ hour$$

The transport company has provided 40%of the total number of trucks. Assuming that these rates are random according to Poisson distribution, determine

a) The probability that a truck has to wait.

b) The waiting time of a truck that waits.

Answer

The probability that a truck has to wait.

$$\frac{\mu}{\mu - \lambda} = \frac{4}{4-3} = \frac{4}{1} = 4$$

The waiting time of a truck that waits.

round about 40 minutes of each truck.

Question No: 46 (Marks: 3)

A company has a machine whose cost is Rs. 30,000. Its maintenance cost and resale value at the end of different years are as given below:

Years.	1	2	3	4	5	6
Maintenance Cost.	4500	4700	5000	5500	6500	7500
Resale Value	27000	25300	24000	21000	18000	13000

Determine capital cost for each year.

Answer

Item / machine cost - resale cost - maintenace cost = capital cost
30000 - 13000 - 7500 => 17000-7500 = 9500
machine capital cost for year 7 is 7500

Question No: 47 (Marks: 3)

A firm produced three products. These products are processed on three different machines. The time required to manufacturer one unit of each of the three products and the daily capacities of the three machines are given in the table:

Machines	**Time per unit (minutes)**			**Machine Capacity (minutes / day)**
	Product 1	**Product 2**	**Product 3**	
M1	2	3	2	440
M2	4	---	3	470
M3	2	3	---	430

It is required to determine the daily number of units to be manufactured for each product. The profit per unit for product 1, 2 and 3 is Rs. 4, Rs. 3 and Rs. 6 respectively. It is assumed that all the amounts produced are consumed in the market.

Write the constraints of above Linear Programming Problem.

Answer

Transportation problem is a special class of linear programming problem in which transport a commodity from the source to a destination in such a way that the total transportation cost is maximum

Question No: 48 (Marks: 3)

Express the following Transportation problem(T.P) table into algebraic form with proper objective function and non-negative constraints

	D_1	D_2	D_3	Supply
O_1	c_{11}	c_{12}	c_{13}	5
O_2	c_{21}	c_{22}	c_{23}	3
O_3	c_{31}	c_{32}	c_{33}	10
Demand	4	6	8	

Answer

$$4x + S_2 + D_1 \leq 5$$
$$S_1 + 6y + D_1 \geq 3$$
$$S_1 + S_2 + 8z \leq 10$$

Question No: 49 (Marks: 5)

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Complete the above transportation Model by Vogel Approximation Method.
And also find the starting basic feasible solution.

Answer

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Cost = 1 + 2 + 7(6) + 2 + 5(1) = 52
This is the initial basic solution consider u1 = 1 and v1 = 2 and v2 = 3

Question No: 50 (Marks: 5)

Check whether the given initial basic feasible solution is optimal or not.

1	2	6 **7**	**7**
0 **10**	4	2 **2**	**12**
3	1 **10**	5 **1**	**11**
10	**10**	**10**	

Answer

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Cost = 1 + 2 + 7(6) + 2 + 5(1) = 52
This is the initial basic solution consider u1 = 1 and v1 = 2 and v2 = 3

it is a n optimal solution according to if we put formula

Question No: 51 (Marks: 5)

A company cost Rs. 500 operations and maintenance costs are zero for the first year and increased by Rs. 100 every year. If money is worth 5% every year, calculate present worth (**P(r)**) for each year. The resale value of the machine is negligibly small.

Answer

for each year increase in money = 5%
means to say that company significes 105 ruppes every year the company capital must be increaing as 105 * 500

Question No: 52 (Marks: 5)

Express the following linear programming problem in standard form and also construct its initial simplex table.

Max $\boldsymbol{Z} = 3\boldsymbol{x}+2\boldsymbol{y}$

Subject to constraints:

$\boldsymbol{x} + \boldsymbol{y} \leq 4$

$\boldsymbol{x} - \boldsymbol{y} \leq 2$

$\boldsymbol{x},\boldsymbol{y} \geq 0$

Answer

Blank Data

Q: A firm has normally distributed forecast of usage with MAD=50 units. It desires a service level, which limits the stock, out to one order cycle per year. Determine Standard Deviation (SD), if the order quantity is normally a week`s supply.

Solution:

$$SD = \sqrt{\frac{\pi}{2}}(50)$$

$$SD = \sqrt{\frac{3.14}{2}}(50)$$

$$SD = \sqrt{1.57}(50)$$

$$SD = (1.25)(50)$$

$$SD = 62.64$$

Q: A company centre has got four experts programmers. The centre needs four application programmers to be developed. The head of the computer centre, after studying carefully the programmer's to be developed, estimate the computer time in minutes required by the respective experts to develop the application programmers as follows.

Programmers	A	B	C	D
1	120	100	80	90
2	80	90	110	70
3	110	140	120	100
4	90	90	80	90

Solution:

Programmers	A	B	C	D
1	30	10	0	10
2	0	10	40	0
3	0	30	20	0
4	0	0	0	10

Programmers	A	B	C	D
1	30	10	**0**	10
2	**0**	10	40	**0**
3	0x	30	20	0x
4	0x	**0**	0x	10

Q: the cost of a new machine is Rs. 5000. The maintenance cost during the nth year is given by M_n = Rs.500 (n-1), where n=1, 2, 3… If the discount rate per year is 0.05, determine discount factor (v^{n-1}) for each year.

Solution:

M = 5000

M_n = 500 (n-1)

V = 0.05

(v^{n-1}) = ?

Nth year	M_n	(v^{n-1})
1	0	1.00

2	500	0.05
3	1000	0.0025
4	1500	0.000125

Or

Nth year	(v^{n-1})
1	1.00
2	0.05
3	0.0025
4	0.000125

Q: Determine whether the following Transportation model has initial feasible solution?

	D_1	D_2	D_3	D_4	Supple
Q_1	x_{11}	x_{12}	x_{13}	x_{14}	6
Q_2	X_{21}	X_{22}	X_{23}	X_{24}	8
Q_3	X_{31}	X_{32}	X_{33}	X_{34}	10
Demand	4	6	8	6	

Solution:

The transportation problems can berepresented mathematically as a linear programming model. The

Objective function in this problem is to minimize the total transportation cost given by

$Z = c_{11}x_{11} + c_{12}x_{12} + \ldots + c_{mn}x_{mn}$

Subject to the restrictions:

Row restrictions:

$x_{11} + x_{12} + x_{13} + x_{14} = 6$

$x_{21} + x_{22} + x_{23} + x_{24} = 8$

$x_{31} + x_{32} + x_{33} + x_{34} = 10$

Column restrictions:

$x_{11} + x_{21} + x_{31} + x_{41} = 4$

$x_{12} + x_{22} + x_{32} + x_{42} = 6$

$x_{13} + x_{23} + x_{33} + x_{43} = 8$

$x_{14} + x_{24} + x_{34} + x_{44} = 6$

And

$x_{11} + x_{12} + x_{13} + x_{14} \geq 0$

It should be noted that the model has feasible solutions only if

$a_1 + a_2 + a_3 + a_4 = 4+6+8+6$

Or

$$\sum_{i=0}^{m} a_i = \sum_{j=1}^{n} b_j$$

Q:

Salesman	Region					
	1	2	3	4	5	6
A	5	0	25	0	15	0
B	**0**	50	0	25	30	45

C	35	15	55	**0**	40	75
D	10	30	5	30	15	**0**
E	25	**0**	30	55	20	30
F	35	35	20	10	**0**	55

Do next step by applying Hungarian method?

Solution:

Salesman	Region					
	1	2	3	4	5	6
A	5	0x	25	0x	15	0x
B	**0**	50	0x	25	30	45
C	35	15	55	**0**	40	75
D	10	30	5	30	15	**0**
E	25	**0**	30	55	20	30
F	35	35	20	10	**0**	55

Here we have only three assignments. But we must have four assignments. With this maximal assignment we have to draw the minimum number of lines to cover all the zeros.

Q: An oil company has 8 unit of money available for exploration of three sites. If oil is present at a site, the probability of finding it depends upon the amount allocated for exploiting the site as given below.

	0	1	2	3	4	5	6	7	8
Site I	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.0
Site II	**0.0**	0.1	0.2	0.3	0.4	0.6	0.7	0.8	1.0
Site III	0.0	0.1	0.1	**0.2**	0.3	0.5	0.8	0.9	1.0

The probability that the oil exits at sites I, II and III is 0.4, 0.3 and 0.2 respectively; we have to find the optimal allocating of money. Stage I is given below, only do stage it.

Stage I

Max. $Z=0.4P_1(x_1)+0.3P_2(x_2)$

Subject to: $x_1+x_1+x_1\leq 8$

No. of boxes x_1	0	1	2	3	4	5	6	7	8
$f_1(x_1)$	0	0	4	8	12	20	28	36	40

Q. a person wants to decide the constituents of a diet which will fulfill his daily requirements of protein, fats and carbohydrates at the minimum cost. The choice is to be made from four different types of foods. The yields per unit of these foods are given in the table below:

Food type	Yield per unit			3 Cost per unit (Rs.)
	Proteins	Fats	carbohydrates	
1	**3**	**2**	**6**	**45**

2 **3** **4**	**4** **8** **6**	**2** **7** **5**	**4** **7** **4**	**40** **85** **65**
Min Requirement	**800**	**200**	**700**	

Solution:

Let x1, x2, x3 and x4 denote the number of units of food of type 1, 2, 3&4 respectively.
Objective is to minimize the cost i.e.
Minimize Z = 45x1+40x2+85x3+65x4
Constraints are on the fulfillment of the daily requirements of various constituents i.e.
Proteins - $3x1 + 4x2 + 8x3 + 6x4 \geq 800$
Fats - $2x1 + 2x2 + 7x3 + 5x4 \geq 200$,
Carbohydrates - $6x1 + 4x2 + 7x3 + 4x4 \geq 700$.
Where x1, x2, x3, x4 each ≥ 0

Fall 2012

Question No: 41 (Marks: 2)

A branch of Punjab National Bank has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8 – hour worki9ng day. If the typewriter is valued at Rs. 1.50 per hour, DetermineAverage system time.

Answer:

$W_s = 1/\mu-\lambda = 1/8-5 = 1/3hr = 1/3*60 = 20$ min

Question No: 42 (Marks: 2)

An oil company has 8 unit of money available for exploration of three sites. If oil is present at a site, the probability of finding it depends upon the amount allocated for exploiting the site as given below:

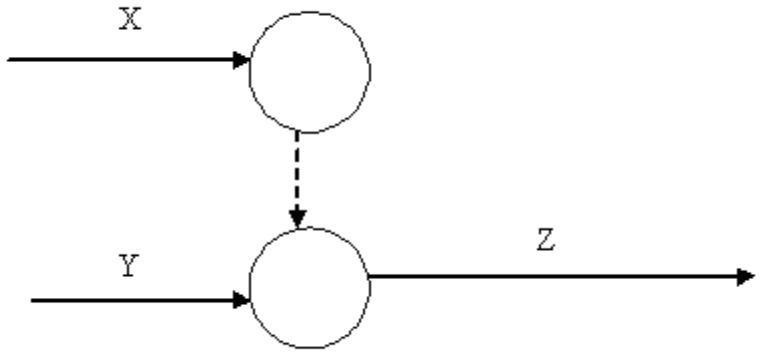
	0	1	2	3	4	5	6	7	8
Site I	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.0
Site II	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.8	1.0
Site III	0.0	0.1	0.1	0.2	0.3	0.5	0.8	0.9	1.0

The probability that the oil exits at sites I, II and III is 0.4, 0.3 and 0.2 respectively; we have to find the optimal allocating of money.

Do stage I only.

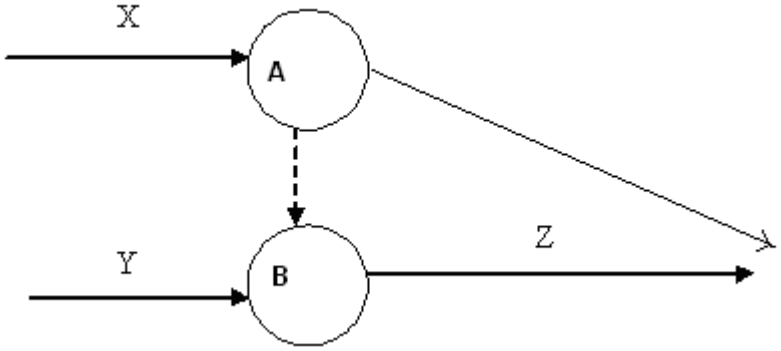
Answer

Not Attempted
Question No: 43 (Marks: 2)



Write the relationship between the activities.

Answer



X approches to Y
X also approches to Z
Y approches to Z
Whether A and b might have the values between the centre points

Question No: 44 (Marks: 2)

For the mathematical form of a Transportation

$$\min z = \sum_{i=1}^{i=m} \sum_{j=1}^{j=n} c_{ij} x_{ij} \text{ ------(1)}$$

problem(T.P)
subject to

$$\sum_{j=1}^{j=n} x_{ij} = a_i \text{ -----(2)} \ , i = 1, 2, \ldots, m(\text{Sources})$$

$$\sum_{i=1}^{i=m} x_{ij} = b_j \text{ -----(3)} \ , i = 1, 2, \ldots, n(\text{Destinations})$$

Describe the practical significance of all the above equations(1), (2) and (3).
Answer :
The above is a mathematical formulation of a transportation problem and we can adopt the linear programming technique with equality constraints. Here the algebraic procedure of the simple method may notbe the best method to solve the problem and hence more efficient and simpler streamlined procedures have been developed to solve transportation problems.

Question No: 45 (Marks: 3)

The milk plant at a city distributes its products by trucks, located at the loading dock. It has its own fleet of trucks plus trucks of a private transport company. This transport company has complained that sometimes its trucks have to wait in line and thus the company loses money paid for a truck and driver that is only waiting. The company has asked the milk plant management either to go in for a second loading dock or discount prices equivalent to the waiting time, the following data available

$$\lambda = Average\ arrival\ rate = 3\ per\ hour$$

$$\mu = Average\ service\ rate = 4\ per\ hour$$

The transport company has provided 40%of the total number of trucks. Assuming that these rates are random according to Poisson distribution, determine

c) The probability that a truck has to wait.

d) The waiting time of a truck that waits.

Answer

The probability that a truck has to wait.

$$\frac{\mu}{\mu - \lambda} = \frac{4}{4-3} = \frac{4}{1} = 4$$

The waiting time of a truck that waits.

round about 40 minutes of each truck.

Question No: 46 (Marks: 3)

A company has a machine whose cost is Rs. 30,000. Its maintenance cost and resale value at the end of different years are as given below:

Years.	1	2	3	4	5	6
Maintenance Cost.	4500	4700	5000	5500	6500	7500
Resale Value	27000	25300	24000	21000	18000	13000

Determine capital cost for each year.
Answer

Question No: 47 (Marks: 3)
A firm produced three products. These products are processed on three different machines. The time required to manufacturer one unit of each of the three products and the daily capacities of the three machines are given in the table:

Machines	**Time per unit (minutes)**			**Machine Capacity (minutes / day)**
	Product 1	**Product 2**	**Product 3**	
M1	2	3	2	440
M2	4	---	3	470
M3	2	3	---	430

It is required to determine the daily number of units to be manufactured for each product. The profit per unit for product 1, 2 and 3 is Rs. 4, Rs. 3 and Rs. 6 respectively. It is assumed that all the amounts produced are consumed in the market. Write the constraints of above Linear Programming Problem.
Answer
Step 1
Find the key decision to be made. The key decision is to decide the extent of product 1,2&3 to be produced as this can vary.
Step 2
Assume symbols for the extent of production. Let the extent of Product 1,2&3 be X1, X2 & X3.
Step 3
Express the feasible alternatives mathematically in terms of variables. Feasible alternatives are those which are physically, economically and financially possible. In this example, feasible alternatives are sets of values of x1, x2 & x3, where x1,x2 &x3 ≥ 0 since negative production has no meaning and is not feasible.
Step 4
Mention the object quantitatively and express it as a linear function of variables. IN the present example, objective is to maximize the profit.
i.e. Maximize Z = 4x1+3x2+6x3
Step 5

Express the constraints as linear equations/inequalities in terms of variables.
Here, constraints are o the machine capacities and can be mathematically expressed as

$2x1 + 3x2 + 2x3 \leq 440,$
$4x1 + 0x2 + 3x3 \leq 470,$
$2x1 + 5x2 + 0x3 \leq 430.$

Question No: 48 (Marks: 3)

Express the following Transportation problem(T.P) table into algebraic form with proper objective function and non-negative constraints

	D_1	D_2	D_3	Supply
O_1	c_{11}	c_{12}	c_{13}	5
O_2	c_{21}	c_{22}	c_{23}	3
O_3	c_{31}	c_{32}	c_{33}	10
Demand	4	6	8	

Answer

$4x + S_2 + D_1 \leq 5$
$S_1 + 6y + D_1 \geq 3$
$S_1 + S_2 + 8z \leq 10$

Question No: 49 (Marks: 5)

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Complete the above transportation Model by Vogel Approximation Method.
And also find the starting basic feasible solution.

Answer

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Cost = 1 + 2 + 7(6) + 2 + 5(1) = 52
This is the initial basic solution consider u1 = 1 and v1 = 2 and v2 = 3

Question No: 50 (Marks: 5)

Check whether the given initial basic feasible solution is optimal or not.

1	2	6 **7**	**7**
0 **10**	4	2 **2**	**12**
3	1 **10**	5 **1**	**11**
10	**10**	**10**	

Answer

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Cost = 1 + 2 + 7(6) + 2 + 5(1) = 52
This is the initial basic solution consider u1 = 1 and v1 = 2 and v2 = 3

it is a n optimal solution according to if we put formula

Question No: 51 (Marks: 5)

A company cost Rs. 500 operations and maintenance costs are zero for the first year and increased by Rs. 100 every year. If money is worth 5% every year, calculate present worth (**P(r)**) for each year. The resale value of the machine is negligibly small.

Answer

for each year increase in money = 5%
means to say that company significes 105 ruppes every year the company capital must be increaing as 105 * 500

Question No: 52 (Marks: 5)

Express the following linear programming problem in standard form and also construct its initial simplex table.
Max $\boldsymbol{Z} = 3\boldsymbol{x}+2\boldsymbol{y}$
Subject to constraints:
$\boldsymbol{x} + \boldsymbol{y} \leq 4$
$\boldsymbol{x} - \boldsymbol{y} \leq 2$
$\boldsymbol{x},\boldsymbol{y} \geq 0$

Answer

Blank Data

Mth601 30 July 2013 final term paper:

2 marks qs
Q: ek bohat sari activities wali diagram di hui thi or qs ye tha
Find EFT for each activity?
Q:

0 5	2	1 1	6
2	1 5	5 2	7
2	4	3 7	7
5	5	10	

To find optimality condition we use UV multiplier process
Find

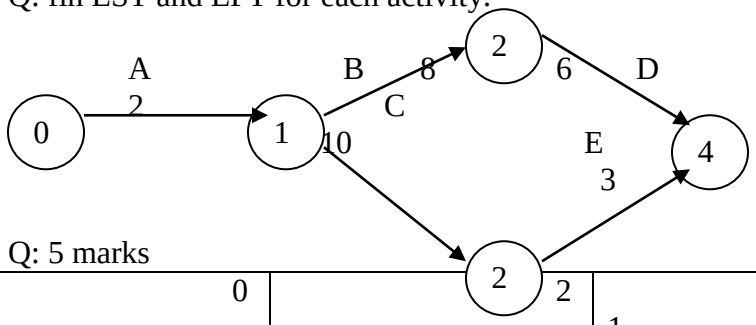
c) U_2+V_2
d) U_3+V_3

Q: 3 ya 5 mark ka tha ye qs
Contractor side wali values yad nai…

Building:	Contractor:
A	
B	
C	

D	

Operate first step by optimizing row wise the above assignment model.
Q: state principal of optimality (optimal policy) for dynamic programming?
Q: fin EST and EFT for each activity.



Q: 5 marks

0 5	2	1 1	6
2	1 5	5 2	7
2	4	3 7	7
5	5	10	

Find
c) P_{31}
d) P_{32}

Using $P_{ij}= U_i + V_j – C_{ij}$ suppose $U_1 = 0$ and $U_2 = 5$
Q: ek statement thi us me se Average Queuing length find krna thi.
Q: Minimizing setup times, which are given? (5 marks)
Job ki values yad nai

	Job 1	**Job2**	**Job3**	**Job4**
Machine 1	14	5	7	
Machine 2				
Machine 3				
Machine 4				

Q: ek 5 mark ka qs itna long tha k word pe paste krne se ek se zyada page ki just statement thi….

Replacement Of Items with change in value and time

It is assumed that the maintenance cost increases with time and each cost is to be paid just in the start of the period. Let the money carry a rate of interest r per year. Thus a rupee invested now will be worth (1 + r) after a year, $(1+r)^2$after two years and so on.

No. of stores	1	2	3
No. of boxes			
0	0	0	0
1	4	2	6
2	6	4	8
3	7	6	8
4	7	8	8
5	7	9	8
7	7	10	8

Do first step?
Answer

No. of stores	1	2	3
No. of boxes			
0	0	0	0
1	2	0	4
2	2	0	4
3	1	0	2
4	0	1	1
5	0	2	1
7	0	3	1

Diff b/w pert n CPM??
Answer
PERT (Programme Evaluation & Review Technique) is event oriented whereas CPM (Critical Path Method) is activity oriented.
In CPM based network analysis no allowance is made for the uncertainties in the duration of time involved.
In CPM, times are related to costs

Q:…Make two steps, of rows and columns of the following table…
Answer:
Least ko sab me se Minus krna hay pehlay rows, then columns, to have atleast one zero in all….

Markets / salesmen	I	II	III	IV

A	44	80	52	60
B	60	56	40	72
C	36	60	48	48
D	52	76	36	40

Markets / salesmen	I	II	III	IV
A	8	24	16	20
B	24	0	4	32
C	0	4	12	8
D	16	20	0	0

Complete the table By VOgha ‘s method:

Sol:
Red is solved one

	1	**2**	**3**	**Supply**
1	0 **5**	2	1 **1**	**6**
2	2	1 **5**	5 **2**	**7**
3	2	4	3 **7**	**7**

Demand	**5**	**5**	**10**	

21 july 2013

1. a branch of bank has only one typist. typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8/hour . Letter arrive rate is 5/hour during the entire 8 hour working day if writer is value 1.50 per hour determine the equipment utilization? 2marks and samethis question is appeared as 5 marks question

2. Scenario was given and we have to tell the objective function of linear programming.... 2 marks

3. Table was given n determine that transportation model has initial feasible solution..... 2 marks

4. State principle of optimality for dynamic programming ..... 2 marks

5. Transportation model was given and one block has x we have to find the value of x..... 3 marks

6. Values were given and we need to tell the capital cost for each year ..... 3 marks

7. In the context of pert and CPMsummarize the project planning techniques

8. One stage problem is given find the two stage problem

s	Fi*(s)	Xi
8	25	10
9	35	10

9. Table was given and asked that check initial solution is feasible or not..... 5 marks

10. Question no 1 was again appeared as 5 marks question

11. The cost of the new machine is 5000. Maintenance during the nth year is given by Mn = 500 rps (n-1) when n = 1, 2, 3 ....if discount rate per year is 0.05 calculate the present worth ..... 5 marks

12. Graph was given and question was construct the table relation show between events and activities. 5 mark s

Virtual University	**MIDTERM EXAMINATION** **SEMESTER SPRING 2005** **MTH601 – Operational Research**	**Total Marks: 50** **Duration:90mins**

StudentID/LoginID	
Name	
PVC Name/Code	
Date	

Maximum Time Allowed: ($1^{1/2}$ Hour)

Please read the following instructions carefully before attempting any of the questions:

1. Attempt all questions. Marks are written adjacent to each question

2. Paste the bitmap image for the tables, diagrams etc while solving your questions

3. Do not ask any questions about the contents of this examination from anyone

a. If you think that there is something wrong with any of the questions, attempt it to the best of your understanding.

b. If you believe that some essential piece of information is missing, make an appropriate assumption and use it to solve the problem.

c. Write all steps, missing steps may lead to deduction of marks.

4. The duration of this examination is **90 minutes**.

5. This examination is closed book, closed notes, closed neighbors.

6. Calculator is allowed

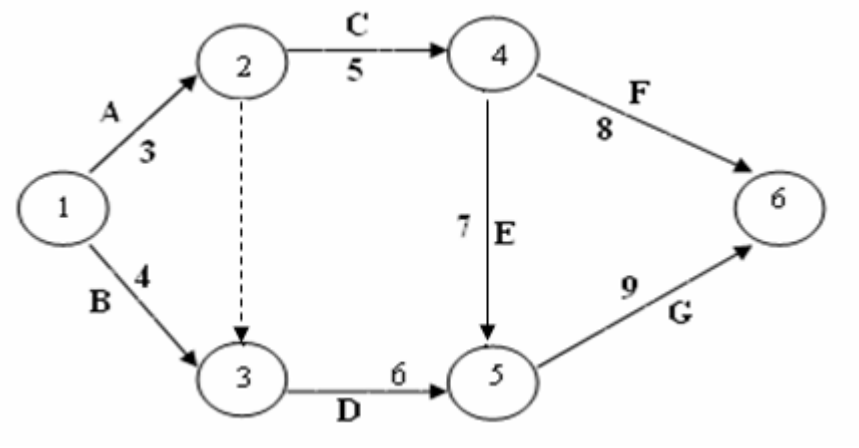
****WARNING: Please note that Virtual University takes serious note of unfair means. Anyone found involved in cheating will get an `F` grade in this course.**

For Teacher's use only

	Descriptive				Multiple Choice Questions										Total
Question	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	4+10=14
Marks															

Question No: 1 **Marks: 10**

For the following project diagram find out Earliest Start Time (**EST**), Earliest Finish Time (**EFT**), Latest Start Time (**LST**), Latest Finish Time (**LFT**) for each activity. Also find the **Critical path**.



NOTE: *There is no need of making diagram corresponds to each step, you have to write down only the required terms correspond to each activity and the justification for the critical path.*

Solution:

Activity	EST	EFT	LST	LFT
A(1 – 2)	0	3	0	3
B(1 – 3)	0	4	5	9

D1(2 – 3)	3	3	9	9
C(2 – 4)	3	8	3	8
D(3 – 5)	4	10	9	15
E(4 – 5)	8	15	8	15
F(4 – 6)	8	16	16	24
G(5 – 6)	15	24	15	24

To find the **Critical Path** we'll find the Slack (Float) of each activity.

Activity	Slack
A(1 – 2)	0
B(1 – 3)	5
D1(2 – 3)	6
C(2 – 4)	0
D(3 – 5)	5
E(4 – 5)	0
F(4 – 6)	8
G(5 – 6)	0

Critical Path: A – C – E – G

Question No: 2 **Marks: 10**

Suppose the following estimates of activity times of a project,

Activity	Optimistic	Most likely	Pessimistic
A	1	3	5
B	3	4	5
C	4	5	6
D	3	5	7
E	5	6	13
F	4	7	10
G	6	8	10

If the critical path of the project is B, D, E, F, then calculate the **Expected Completion Time** (Length of the path) and **Variance** for the project

Solution:

Critical Activities	Optimistic Time (t_o)	Most Likely Time (t_m)	Pessimistic Time (t_p)	Expected Duration (t_e)	Variance
B	3	4	5	4	0.11
D	3	5	7	5	0.44
E	5	6	13	7	1.78
F	4	7	10	7	1

Expected Completion time = 4 + 5 + 7 + 7

= 23

Variance (of the project) = 0.11 + 0.44 + 1.78 + 1

= 3.33

Question No: 3 **Marks: 10**

Demand for the product is 600 units per week, and the items are withdrawn at a constant rate. The setup cost for placing an order to replenish inventory is $25. The unit cost of each item is $3, and the inventory holding cost is $0.05 per item per week.

(a). Assuming shortages are not allowed, determine how often to make a production run and what size it should be.

(b). If shortages are allowed but cost $2 per item per month, determine how often to order and what size the order should be.

Solution:

Demand (D) = 600 unit/week

Ordering Cost (C_2) = \$25/order

Item Cost (C_1) = \$3/item

Holding Cost (C_3) = \$0.05 /item/week

(a). Shortages are not allowed:

Q* =?

t* = ?

$Q^* = \sqrt{2C_2D/C_3}$

Putting all the values in the above formula we have

$Q^* = \sqrt{2*25*600/0.05}$

$Q^* = \sqrt{600000}$

Q*= 774.59

t*=Q*/D

= 774.59/600

= 1.29

(b). Shortages are allowed:

Shortage Cost (C_4) = \$2 /item/month

= 2 / 4.33

= 0.46 /item/week

Q* =?

t* =?

$Q^* = \sqrt{2C_2D/C_3} * \sqrt{(C_3+C_4)/C_4}$

$= 774.596 * \sqrt{(0.05+0.46)/0.46}$

$= 813.32$

$t^* = Q^*/D$

$= 813.32/600$

$= 1.36$

Question No: 4 **Marks: 10**

Marshal Hotel in Islamabad remains open 24 hours a day. Waiters and busboys report for duty at; 3 AM, 11 AM, 3PM, 7 PM or 11 PM and each works an 8-hour shift. The following table shows the minimum number of workers needed during the six periods into which the day is divided. The hotel's scheduling problem is to determine how many waiters and busboys should report for work at the start of each period in order to minimize the total staff required for one day's operation.

Period	Time	Number of waiters and busboys required
1	03 AM - 07 AM	3
2	07 AM - 11 AM	12
3	11 AM - 03 PM	16
4	03 PM - 07 PM	9
5	07 PM - 11 PM	11
6	11 PM - 03 AM	4

Formulate the problem as an LP model.

Solution:

Decision variables

Let

x_1 = number of workers starting work in period 1

x_2 = number of workers starting work in period 2

x_3 = number of workers starting work in period 3

x_4 = number of workers starting work in period 4

x_5 = number of workers starting work in period 5

x_6 = number of workers starting work in period 6

Objective function

In this problem we have to minimize the total staff size

That is objective function is:

Minimize $Z = x_1 + x_2 + x_3 + x_4 + x_5 + x_6$

Constraints:

Since there are 8 hour shift so the number of workers in each period consist of those who start work in that period plus those who started in the previous period(as there are 4 hours for each period)

Periods	Minimum Requirements
1 and 2	12
2 and 3	16
3 and 4	9
4 and 5	11
5 and 6	4
6 and 1	3

$x_1 + x_2 \geq 12$

$x_2 + x_3 \geq 16$

$x_3+x_4 \geq 9$

$x_4+x_5 \geq 11$

$x_5+x_6 \geq 4$

$x_6+x_1 \geq 3$

$x_i \geq 0$

Now the LP problem is

Minimize Z = $x_1+ x_2+ x_3+ x_4 + x_5+ x_6$

Subject to,

$x_1+x_2 \geq 12$

$x_2+x_3 \geq 16$

$x_3+x_4 \geq 9$

$x_4+x_5 \geq 11$

$x_5+x_6 \geq 4$

$x_6+x_1 \geq 3$

$x_i \geq 0$

Question No: 5 **Marks:10**

Select the best choice (Only one) from the given four choices against each question.

1. _____ is any stored resource that is used to satisfy a current or future need

(a). Inventory

(b). Simulation

(c). Allocation

(d). None of the above

2. Which one is best describe Micro Economic Planning?

(a). Distribution of fertilizer

(b). Improving the layout of a workshop in a company

(c). Investment planning of the country

(d). All of the above

3. The purpose of CPM is

(a). Obtain least cost schedule

(b). Strike a balance or an optimum time schedule

(c). Both a & b

(d). None of the above

4. _____ = EST + Time required to perform the jobs

(a). Early Finish Time

(b). Latest Start Time

(c). Latest Finish Time

(d). None of the above

5. Free slack can never exceeds

(a). Total Slack

(b). Independent Slack

(c). Both a & b

(d). None of the above

6. The formula for calculating expected time t_e is

(a). $t_e = \frac{(t_m + 4t_0 + t_p)}{6}$

(b). $t_e = \frac{(t_0 + 4t_m + t_p)}{6}$

(c). $t_e = \frac{(t_0 + 4t_p + t_m)}{6}$

(d). None of the above

7. In LP problem, the decision variables can be divided into any fractional levels, so that non-integer values for the decision variables are permitted. This assumption is know as

(a). Additivity

(b). Proportionality

(c). Divisibility

(d). None of the above

8. “OR is the scientific method of providing executive departments with a quantitative basis for decision regarding the operations under their control”. This definition was given by

(a). Blackett in 1948

(b). Morse and Kimbel in 1946

(c). Churchment Ackoff and Arnoff in 1957

(d). Saaty in 1958

9. Which of the following is a characteristic of critical path scheduling techniques?

(a). The jobs or tasks are dependent on each other.

(b). Interruptions may be permitted if they are documented.

(c). The jobs or tasks must be well defined, and their completion marks the end of the project.

(d). The jobs or tasks do not necessarily have to be in a predetermined sequence

10. If $t_0 = 2$, $t_m = 5$ and $t_p = 14$, then V_t= _____

(a). 2 hrs

(b). 3 hrs

(c). 4 hrs

(d). None of the above

Mth601_Operations Research

Midterm

Solved Papers....!!

1. _____ employs a different modeling and solution logic than linear programming
(a). Transportation Model
(b). Inventory Control Model
(c). Dynamic Programming
(d). None of the above

2. To identify and maintain the proper precedence relationship between activities those are not connected by event, we introduce
(a). Parallel Activity
(b). Dummy Activity
(c). Sequential Activity
(d). None of the above

3. EST and EFT of activities are calculated in
(a). Forward pass
(b). Backward pass

4. Critical path is obtained by connecting the jobs having
(a). Activities having same EST and LST
(b). Activities having same EFT and LFT
(c). Activities having zero slack
(d). All of the above

5. The Variance Vt of expected time is calculated as
(a). $V_t = (\frac{t_m - t_0}{6})^2$
(b). $V_t = (\frac{t_0 - t_p}{6})^2$
(c). $V_t = (\frac{t_p - t_m}{6})^2$
(d). None of the above

6. In LP problems Additivity means that
(a). The effect of two different programs of production is the same as that of a joint program

(b). The doubling (or tripling) the product will exactly double (or triple) the profit and the required
resource
(c). Both (a)& (b)
(d). None of the above

7. Two of the first steps of OR process encompass the actual use of OR techniques. These steps are
(a). Model Construction and Model Solution
(b). Observation and Implementation
(c). Definition of the problem and Model Solution
(d). Model Solution and Implementation of results

8. Let FS = Free Slack, TS = Total Slack, INDS = Independent Slack, then which relation is true
(a). TS $\leq$ FS
(b). INDS $\leq$ FS
(c). FS $\leq$ TS
(d). Both (b) & (c)

9. Best possible time estimate that a given activity would take under normal conditions which often exist, is called
(a). Most Likely time estimate
(b). Pessimistic time estimate
(c). Smallest time estimate
(d). None of the above

10. Standard Deviation S.D is
(a). One sixth of the difference between pessimistic time estimates and optimistic time estimates
(b). One sixth of the difference between pessimistic time estimates and most likely time estimates
(c). One sixth of the difference between optimistic time estimates and most likely time estimates (d). One sixth of the difference between most likely time estimates and optimistic time estimates

Which one is best describe Sectoral planning

? Inventory Planning in agriculture

? Improving the layout of a workshop in a company

? Simulation Modeling of the Economy of the country

? None of these.

_____ is the most appropriate to situations where we maintain a relative stable employment levels and utilize the resource at a more constant rate

? (a). Resource Leveling Program

? (b). Resource Allocation Program

? (c). Both a & b

? (d). None of these.

If the slack time is zero, it means that the project will be

? Delayed

? Completed on schedule

The amount of an activity can be delayed without affecting the early start time of any other job, is called

? Free Slack

? Independent Slack

? Total Slack

? None of these.

Question No: 1 (Marks: 1) - Please choose one

EST and EFT of activities are calculated in

► **Forward pass**

► Backward pass

► Path does not effected

Question No: 2 (Marks: 1) - Please choose one

_____ may be less than most likely time estimate

- ► **Pessimistic time estimate**
- ► Smallest time estimate
- ► Optimistic Time estimate

Question No: 3 (Marks: 1) - Please choose one

The dummy activities consume

- ► **No time, no resources**
- ► No time but some resources
- ► Some resources in minimum time
- ► None of these

Question No: 4 (Marks: 1) - Please choose one

If an activity consumes no time and no resources then this activity is called _____.

- ► **dummy activity**
- ► sequential activity
- ► critical activity
- ► cyclic activity

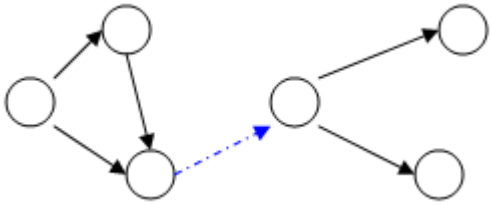
Question No: 5 (Marks: 1) - Please choose one

Cost period = ------- × (No of ordered items)

- ► Holding cost
- ► Set up cost
- ► Stock out cost
- ► **Item cost**

Question No: 6 (Marks: 1) - Please choose one

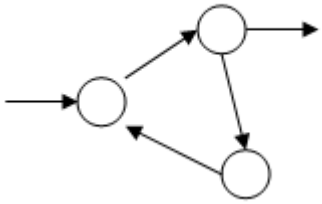
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- ► Redundancy
- ► Cycling
- ► Looping
- ► **Merging**

Question No: 7 (Marks: 1) - Please choose one

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Which one is best describe Micro Economic Planning?

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If $t_0 = 6$, $t_m = 12$ and $t_p = 18$, then V_t= _____

- 12
- 2
- **4**
- 144

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Which inventory model also known as a saw tooth model?

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- Purchasing Model with shortages
- Manufacturing Model with no shortages
- Manufacturing Model with shortages

Question No: 11 (Marks: 1) - Please choose one

For backward pass computations

- Earliest start time $\geq$ Latest start time
- Earliest start time $\leq$ Latest start time
- Earliest start time $+$ Latest start time = 0
- Earliest start time $=$ Latest start time

Question No: 12 (Marks: 1) - Please choose one

For an activity if optimistic time, most likely time estimate and pessimistic time estimate are **3, 6** and **15** respectively then expected time is

- 4
- 3
- **7**
- 20

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- ► Only objective function is quadratic
- ► Both objective function and constraints are quadratic
- ► Only constraints are quadratic
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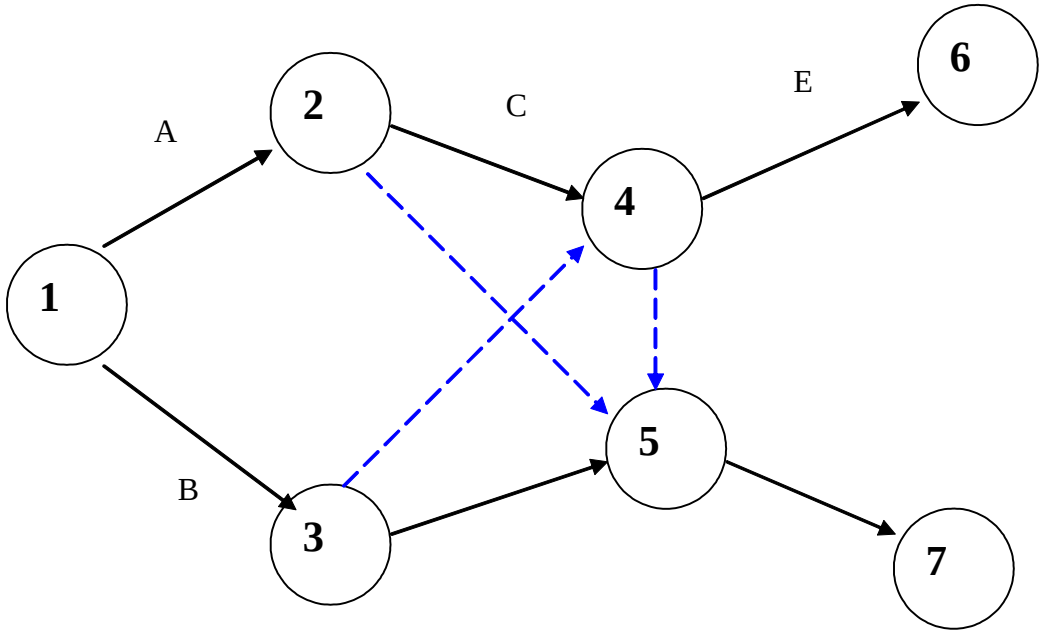
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A forward pass is used to determine and calculate the _____ dates, through utilization of a previously specified start date.

- **early start and early finish**
- late start and early finish
- early start and late finish
- late start and late finish

Question No: 18 (Marks: 1) - Please choose one

Is this Network legal?



- Yes.
- **No.**

Question No: 19 (Marks: 1) - Please choose one

Total cost per period = Item cost + Order cost + Holding cost + _____.

- Shortage cost
- Optimum Shortage (S*)
- Economic Oreder Quantity. (Q*)
- Maximum Inventory. ($I_{max.}$)

Question No: 20 (Marks: 1) - Please choose one

$K = Z \times (- - —)$

Where K is called service factor.

- $\sqrt{\pi/2}$
- $\sqrt{2/\pi}$
- $\sqrt{2\pi/3}$
- $\sqrt{3\pi/2}$

MTH601 Solved Midter MCQS File

1. _____ employs a different modeling and solution logic than linear programming
(a). Transportation Model
(b). Inventory Control Model
(c). Dynamic Programming
(d). None of the above

2. To identify and maintain the proper precedence relationship between activities those are not connected by event, we introduce
(a). Parallel Activity
(b). Dummy Activity
(c). Sequential Activity
(d). None of the above

3. EST and EFT of activities are calculated in
(a). Forward pass
(b). Backward pass

4. Critical path is obtained by connecting the jobs having
(a). Activities having same EST and LST
(b). Activities having same EFT and LFT
(c). Activities having zero slack
(d). All of the above

5. The Variance Vt of expected time is calculated as
(a). $V_t = (\frac{t_m - t_0}{6})^2$
(b). $V_t = (\frac{t_0 - t_p}{6})^2$
(c). $V_t = (\frac{t_p - t_m}{6})^2$
(d). None of the above

6. In LP problems Additivity means that
(a). The effect of two different programs of production is the same as that of a joint program
(b). The doubling (or tripling) the product will exactly double (or triple) the profit and the required
resource
(c). Both (a)& (b)
(d). None of the above

7. Two of the first steps of OR process encompass the actual use of OR techniques. These steps are
(a). Model Construction and Model Solution

(b). Observation and Implementation
(c). Definition of the problem and Model Solution
(d). Model Solution and Implementation of results

8. Let FS = Free Slack, TS = Total Slack, INDS = Independent Slack, then which relation is true
(a). TS $\leq$ FS
(b). INDS $\leq$ FS
(c). FS $\leq$ TS
(d). Both (b) & (c)

9. Best possible time estimate that a given activity would take under normal conditions which often exist, is called
(a). Most Likely time estimate
(b). Pessimistic time estimate
(c). Smallest time estimate
(d). None of the above

10. Standard Deviation S.D is
(a). One sixth of the difference between pessimistic time estimates and optimistic time estimates
(b). One sixth of the difference between pessimistic time estimates and most likely time estimates
(c). One sixth of the difference between optimistic time estimates and most likely time estimates (d). One sixth of the difference between most likely time estimates and optimistic time estimates

Which one is best describe Sectoral planning

? Inventory Planning in agriculture

? Improving the layout of a workshop in a company

? Simulation Modeling of the Economy of the country

? None of these.

_____ is the most appropriate to situations where we maintain a relative stable employment levels and utilize the resource at a more constant rate

? (a). Resource Leveling Program

? (b). Resource Allocation Program

? (c). Both a & b

? (d). None of these.

If the slack time is zero, it means that the project will be

? Delayed

? Completed on schedule

The amount of an activity can be delayed without affecting the early start time of any other job, is called

? Free Slack

? Independent Slack

? Total Slack

? None of these.

Question No: 1 (Marks: 1) - Please choose one

EST and EFT of activities are calculated in

► **Forward pass**

► Backward pass

► Path does not effected

Question No: 2 (Marks: 1) - Please choose one

_____ may be less than most likely time estimate

- ► **Pessimistic time estimate**
- ► Smallest time estimate
- ► Optimistic Time estimate

Question No: 3 (Marks: 1) - Please choose one

The dummy activities consume

- ► **No time, no resources**
- ► No time but some resources
- ► Some resources in minimum time
- ► None of these

Question No: 4 (Marks: 1) - Please choose one

If an activity consumes no time and no resources then this activity is called _____.

- ► **dummy activity**
- ► sequential activity
- ► critical activity
- ► cyclic activity

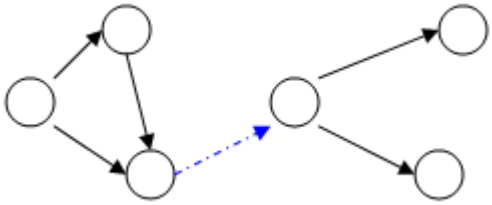
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Cost period = ------- × (No of ordered items)

- ► Holding cost
- ► Set up cost
- ► Stock out cost
- ► **Item cost**

Question No: 6 (Marks: 1) - Please choose one

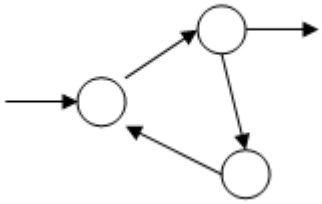
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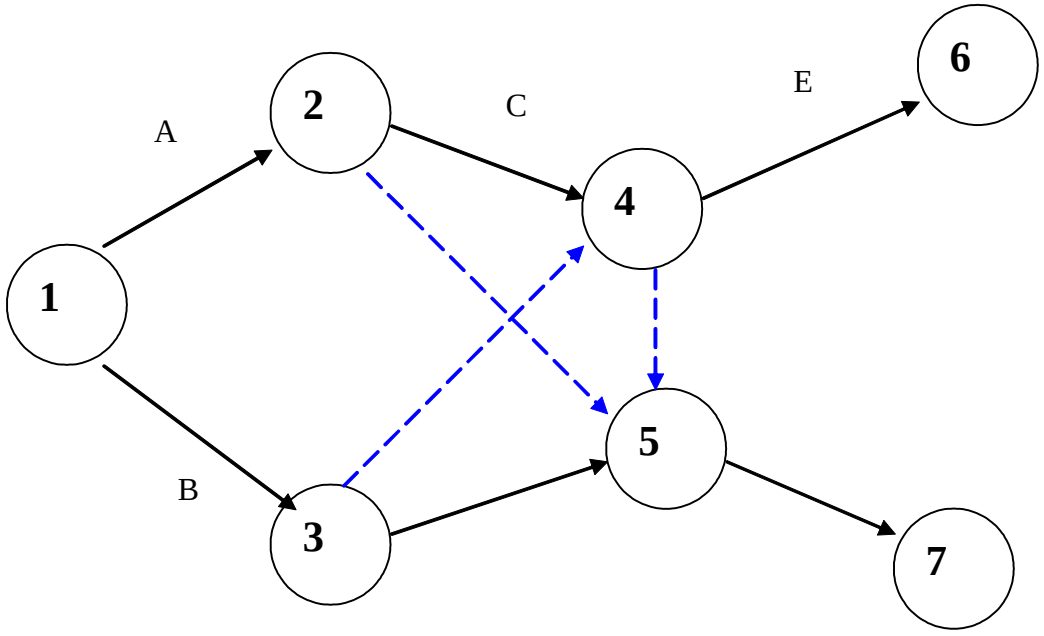
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- $\sqrt{3\pi/2}$

Mth601 30 July 2013 final term paper:

2 marks qs
Q: ek bohat sari activities wali diagram di hui thi or qs ye tha
Find EFT for each activity?
Q:

0 5	2	1 1	6
2	1 5	5 2	7
2	4	3 7	7
5	5	10	

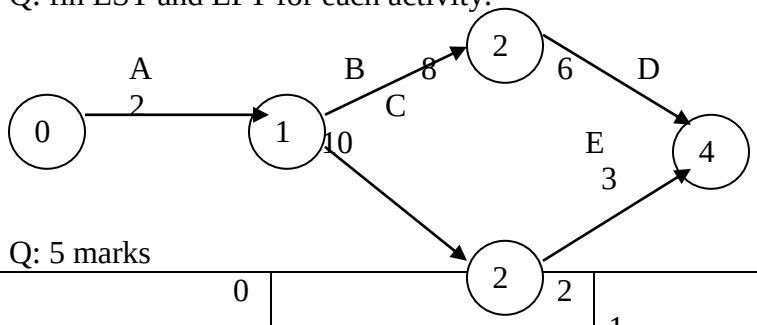
To find optimality condition we use UV multiplier process
Find

e) U_2+V_2
f) U_3+V_3

Q: 3 ya 5 mark ka tha ye qs
Contractor side wali values yad nai…

Building:	Contractor:
A	
B	
C	
D	

Operate first step by optimizing row wise the above assignment model.
Q: state principal of optimality (optimal policy) for dynamic programming?
Q: fin EST and EFT for each activity.



Q: 5 marks

0 5	2	1 1	6
2	1 5	5 2	7

2	4	3 7	7
5	5	10	

Find

e) P_{31}

f) P_{32}

Using $P_{ij}= U_i + V_j – C_{ij}$ suppose $U_1 = 0$ and $U_2 = 5$

Q: ek statement thi us me se Average Queuing length find krna thi.

Q: Minimizing setup times, which are given? (5 marks)

Job ki values yad nai

	Job 1	**Job2**	**Job3**	**Job4**
Machine 1	14	5	7	
Machine 2				
Machine 3				
Machine 4				

Q: ek 5 mark ka qs itna long tha k word pe paste krne se ek se zyada page ki just statement thi….

Plz pray for me……..

FINALTERM EXAMINATION
Fall 2012
MTH601 - Operations Research

Ref No: 3886822
Time: 120 min

Question No: 1 (Marks: 1) - Please choose one

Which of the following is a characteristic of critical path scheduling techniques?

► The jobs or tasks are dependent on each other
► Interruptions may be permitted if they are documented

Selected answer The jobs or tasks must be well defined, and their completion marks the end of the project

► The jobs or tasks do not necessarily have to be in a predetermined sequence

Question No: 2 (Marks: 1) - Please choose one

During a replacement if the value of money decreases at the rate of **3**% then the present worth factor of unit amount to be spent after one year is given by

► 0.25
► 0.333

Selected answer 0.9708

► 4

Question No: 3 (Marks: 1) - Please choose one

If the money carries a rate of interest of **12**% per year, the present worth factor of one rupee due in one year is

Selected answer 0.08333

► 0.89285
► 0.0769
► 13

Question No: 4 (Marks: 1) - Please choose one

Search and cutting methods are used to solve following types of problems

► Transportation
► Assignment

Selected answer Integer Programming

► Queuing problems

Question No: 5 (Marks: 1) - Please choose one

A feasible solution is called a _____ solution if the number of non negative allocation is equal to "m + n – 1" (Here m is the number of rows, n is the number of columns in transportation problem)

Selected answer basic feasible

- ► non basic feasible
- ► basic infeasible
- ► optimal

Question No: 6 (Marks: 1) - Please choose one

If a basic feasible solution contains less than "m + n – 1" (Here m is the number of rows, n is the number of columns in transportation problem) non negative allocation, then it is said to be

- ► Degenerate
- ► Multiple Solutions
- ► Non degenerate

Selected answer Alternative Optima

Question No: 7 (Marks: 1) - Please choose one

Consider the following cost table

		Destinations			
Source		**D1**	**D2**	**D3**	**Supply**
	S1	5	1	2	**25**
	S2	7	2	4	**10**
	S3	3	3	5	**15**
	Demand	**10**	**20**	**20**	

Using Vogel's Approximation Method, which one is the starting cell?

Selected answer S1 à D1

- ► S3 à D1
- ► S2 à D2
- ► S2 à D1

Question No: 8 (Marks: 1) - Please choose one

		Destinations			
		D1	D2	D3	Supply
Source	S1	5	1	2	25
	S2	7	2	4	10
	S3	3 10	3	5	15
	Demand	10	20	20	

Using Vogel's Approximation Method:
These below are the three cells which can be next cell:

I. S3 → D2
II. S2 → D2
III. S1 → D3

Which one is the correct option?

► I, II and III
► I only
► II only

Selected answer III only

► I and II only

Question No: 9 (Marks: 1) - Please choose one

	D1	D2	D3	Supply
S1	5 10	1 15	2	25
S2	7	2 5	4 5	10
S3	3	3	5 15	15
Demand	10	20	20	

Cost = 10 (5) + 15 (1) + 5 (2) + 5 (4) + 15 (5) = 170

This is the initial basic feasible solution of a question by North – West Corner Method.

Finding optimal basic feasible solution: Consider U1 = 0 and V1 = 5, what is the value of V2?

- ► □
- ► □
- ► □

Selected answer □

Question No: 10 (Marks: 1) - Please choose one

Transportation problem is a special class of linear programming problem in which transport a commodity from the source to a destination in such a way that the total transportation cost is

- ► Zero
- ► Maximum

Selected answer Minimum

- ► Average

Question No: 11 (Marks: 1) - Please choose one

We solve a assignment problem by subtracting least number in each row and we get the table below:

Cost Table	Dist Center D	Dist Center E
Plant A	0	135
Plant B	0	8
Plant C	34	0

After doing next step, which table should be next?

Cost Table	Dist Center D	Dist Center E
Plant A	0	135
Plant B	0	8
Plant C	34	0

▶

Cost Table	Dist Center D	Dist Center E
Plant A	0	127
Plant B	0	0
Plant C	0	0

▶

Cost Table	Dist Center D	Dist Center E
Plant A	135	0
Plant B	8	0
Plant C	0	34

►

Cost Table	Dist Center D	Dist Center E
Plant A	0	0
Plant B	34	8
Plant C	0	135

Selected answer

Question No: 12 (Marks: 1) - Please choose one

The cost matrix in assignment problem is always

Selected answer identity matrix

► zero matrix
► diagonal matrix
► square matrix

Question No: 13 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then the average system time is:

► 1/5

Selected answer 5

► 1

► 2

Question No: 14 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then ρ (traffic intensity or system utilization) =?

► □□□

Selected answer □□□

► □□□

► □□□

Question No: 15 (Marks: 1) - Please choose one

Formula for the expected number in the system L is:

$$L=\frac{\lambda}{\mu-\lambda}$$

►

$$L=\frac{\lambda}{\mu+\lambda}$$

►

$$L=\frac{\lambda}{\lambda-\mu}$$

►

$$L=\frac{\mu}{\mu-\lambda}$$

Selected answer

Question No: 16 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then the expected number in the queue or average queue length is:

► □□□

Selected answer □

► □

► □□□

Question No: 17 (Marks: 1) - Please choose one

Total cost per period = Item cost + Order cost + Holding cost + _____.

Selected answer Shortage cost

► Optimum Shortage (S*)

► Economic Oreder Quantity. (Q*)

► Maximum Inventory. ($I_{max.}$)

Question No: 18 (Marks: 1) - Please choose one

In Manufacturing Model with no shortage, the replacement rate is finite and _____ the demand rate.

► greater than

Selected answer less than

► equal to

Question No: 19 (Marks: 1) - Please choose one

If "N*i*" be the Number of replacement made at the end of the i^{th} week and "P*j*" be the probability of failure during the i^{th} week, then N_1 = ----------.

► N_0P_1

Selected answer N_1P_1

► N_0P_0

► N_1P_2

Question No: 20 (Marks: 1) - Please choose one

If "N*i*" be the Number of replacement made at the end of the i^{th} week and "P*j*" be the probability of failure during the i^{th} week, then N_2 = ----------.

► $N_1P_2 + N_1P_1$

► $N_0P_2 + N_1P_1$

► $N_0P_1 + N_1P_2$

► $N_0P_2 + N_1P_2$

Question No: 21 (Marks: 1) - Please choose one

The present worth of a rupee to be spent after a year is denoted by *v* and given by

► $v = (1 + r)$

► $v = (1 / r)$

► $v = (1 + r) / 10$

Selected answer $v = 1/ (1 + r)$

Question No: 22 (Marks: 1) - Please choose one

Formula for a geometric series "$x + vx + v^2x + ... + v^{n-1}x$" is

$$P(n) = \frac{1-v^n}{1-v}$$

Selected answer

$$P(n) = x\frac{1-v}{1-v^n}$$

▶

$$P(n) = \frac{1-v}{1-v^n}$$

▶

$$P(n) = x\ \frac{1-v^n}{1-v}$$

▶

Question No: 23 (Marks: 1) - Please choose one

In replacement Models, Capital Cost = (Item / Machine Cots) – (----------).

▶ Resale Cost

▶ Running Cost

Selected answer Maintenance Cost

▶ Operating Cost

Question No: 24 (Marks: 1) - Please choose one

Formula of EOQ in manufacturing model with shortages is

$$Q^* = \sqrt{2C_2D/C_3(1-D/R)}.\sqrt{C_3+C_4/C_4}$$

▶

$$Q^* = \sqrt{2C_2D/C_3}.\sqrt{R/R-D}$$

Selected answer

$$Q^* = \sqrt{2C_2D/C_3}$$

▶

▶ Non of them

Question No: 25 (Marks: 1) - Please choose one

To identify and maintain the proper precedence relationship between activities those are not connected by event, we introduce

- ▶ Parallel Activity

Selected answer Dummy Activity

- ▶ Sequential Activity
- ▶ None of these

Question No: 26 (Marks: 1) - Please choose one

PERT is based on

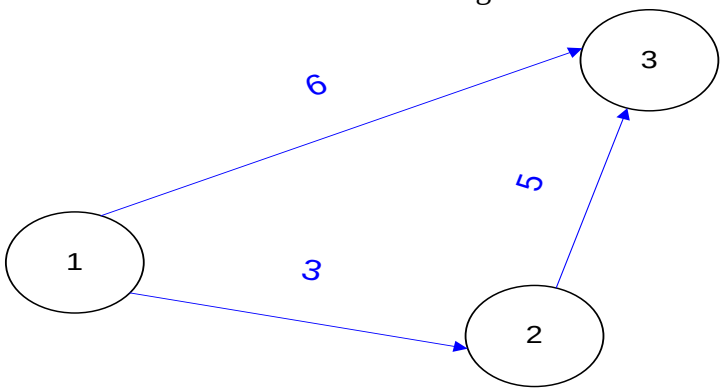
- ▶ Deterministic times

Selected answer Probabilistic Times

- ▶ Dummy Times
- ▶ Estimated times

Question No: 27 (Marks: 1) - Please choose one

Non-critical activities in the following network are -------



- ▶ Activity (1,2)
- ▶ Activity (2,3)

Selected answer Dummy Actvity

- ▶ Activity (1,3)

Question No: 28 (Marks: 1) - Please choose one

If $t_0 = 10$, $t_m = 10$ and $t_p = 16$, then *S.D* = _____.

- ▶ □□

► □□□ tp-to/6
► □

Selected answer □□

Question No: 29 (Marks: 1) - Please choose one

Which of the following is an essential characteristic of a linear programming problem?

► The relationship between variables and constraints must be linear
► The model must have an objective function
► The model must have structural constraints

Selected answer All are equivalent

Question No: 30 (Marks: 1) - Please choose one

In the simplex table for a linear programming problem, we select the leaving basic variable corresponds to ----------

► Maximum non-negative ratio
► Maximum negative ratio

Selected answer Minimum non-negative ratio

► Minimum negative ratio

Question No: 31 (Marks: 1) - Please choose one

A technique for solving a linear programming problems in which artificial variables are included with coefficients of very large number say equal 10 times of any cost coefficient of decision variables is known as ---------

► Big M – Method.
► Least Cost Method
♦♏●♏♍♦♏♎ ♋■♦♦♏❒ Hungarian Method
Branch and Bound Method

Question No: 32 (Marks: 1) - Please choose one

If the _____ variables appear in the final basic set, then the LP (Linear Program) has no solution.

► slack
► surplus
► non – basic

Selected answer artificial

Question No: 33 (Marks: 1) - Please choose one

If no _____ variable appears in the basis and the optimality conditions are satisfied, then the current solution will be optimal one.

► artificial

Selected answer non basic

► slack

► surplus

Question No: 34 (Marks: 1) - Please choose one

Min. Z = 0 and no artificial variable appears in the basic variables. _____ solution to original problem has been found and we proceed to phase II method.

► A basic feasible

► An optimal

Selected answer An infeasible

Question No: 35 (Marks: 1) - Please choose one

In Two – Phase method, if all the _____ variables become zero, we stop the phase I and proceed to phase-II.

► artificial

Selected answer basic

► non basic

► positive slack

► negative slack

Question No: 36 (Marks: 1) - Please choose one

The inequality $2x+3y\leq 18$ is equivalent to

► $2x+3y\leq -18$

Selected answer $-2x-3y\geq 18$

► $-2x-3y\geq -18$

► $-2x-3y\leq -18$

Question No: 37 (Marks: 1) - Please choose one

Which of the following order pair would minimize the objective function of the linear programming problem; z = x + y subject to x≥3, y≥0 ?

► (3,3)

Selected answer (3,0)

► (0,3)

► (0,0)

Question No: 38 (Marks: 1) - Please choose one

In which of the following models, Simplex algorithm is not preferred to use due to laborious computations?

► Transportations models

► Degenerate Linear models

► Non-degenerate Linear models

Selected answer Dual or unbounded linear models

Question No: 39 (Marks: 1) - Please choose one

Transportations models consist of ------- like the production centers and --------- which may be the sales centers.

► (sinks, sources)

► (sources, sinks)

Selected answer (origins, sources)

► (sinks, destinations)

Question No: 40 (Marks: 1) - Please choose one

To convert the transportation problem into a maximization model we have to----------.

► write the inverse of the coefficient matrix
► multiply the feasibility condition by –1
► multiply the coefficient matrix by –1

Selected answer We can't convert the transportation problem into a maximization problem, as it is basically a minimization problem.

Question No: 41 (Marks: 2)

A branch of Punjab National Bank has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8 – hour worki9ng day. If the typewriter is valued at Rs. 1.50 per hour, Determine

Average system time.

Answer

Not Attempted

Question No: 42 (Marks: 2)

An oil company has 8 unit of money available for exploration of three sites. If oil is present at a site, the probability of finding it depends upon the amount allocated for exploiting the site as given below:

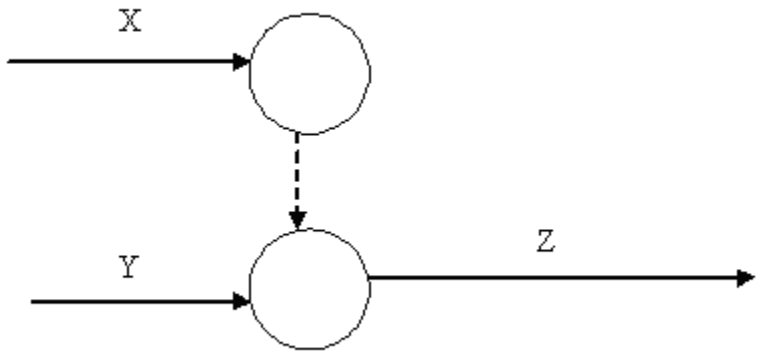
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The probability that the oil exits at sites I, II and III is 0.4, 0.3 and 0.2 respectively; we have to find the optimal allocating of money.
Do stage I only.

Answer

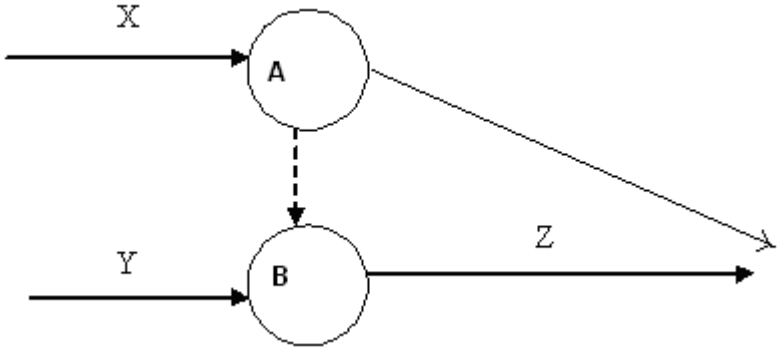
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Write the relationship between the activities.

Answer



X approches to Y
X also approches to Z
Y approches to Z
whether A and b might have the values between the centre points

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For the mathematical form of a Transportation problem(T.P):

$$\min z = \sum_{i=1}^{i=m} \sum_{j=1}^{j=n} c_{ij} x_{ij} \quad -----(1)$$

subject to

$$\sum_{j=1}^{j=n} x_{ij} = a_i \text{ -----(2)} \ , i = 1, 2, \ldots, m(\text{Sources})$$

$$\sum_{i=1}^{i=m} x_{ij} = b_j \text{ -----(3)} \ , i = 1, 2, \ldots, n(\text{Destinations})$$

Describe the practical significance of all the above equations(1), (2) and (3).

Answer

Not Attempted

Question No: 45 (Marks: 3)

The milk plant at a city distributes its products by trucks, located at the loading dock. It has its own fleet of trucks plus trucks of a private transport company. This transport company has complained that sometimes its trucks have to wait in line and thus the company loses money paid for a truck and driver that is only waiting. The company has asked the milk plant management either to go in for a second loading dock or discount prices equivalent to the waiting time, the following data available

$$\lambda = Average\, arrival\, rate = 3\ per\ hour$$
$$\mu = Average\, service\, rate = 4\ per\ hour$$

The transport company has provided 40%of the total number of trucks. Assuming that these rates are random according to Poisson distribution, determine

a) The probability that a truck has to wait.

b) The waiting time of a truck that waits.

Answer

The probability that a truck has to wait.

$$\frac{\mu}{\mu - \lambda} = \frac{4}{4-3} = \frac{4}{1} = 4$$

The waiting time of a truck that waits.

round about 40 minutes of each truck.

Question No: 46 (Marks: 3)

A company has a machine whose cost is Rs. 30,000. Its maintenance cost and resale value at the end of different years are as given below:

Years.	1	2	3	4	5	6
Maintenance Cost.	4500	4700	5000	5500	6500	7500
Resale Value	27000	25300	24000	21000	18000	13000

Determine capital cost for each year.

Answer

Item / machine cost - resale cost - maintenace cost = capital cost
30000 - 13000 - 7500 => 17000-7500 = 9500
machine capital cost for year 7 is 7500

Question No: 47 (Marks: 3)

A firm produced three products. These products are processed on three different machines. The time required to manufacturer one unit of each of the three products and the daily capacities of the three machines are given in the table:

Machines	Time per unit (minutes)			Machine Capacity (minutes / day)
	Product 1	Product 2	Product 3	
M1	2	3	2	440
M2	4	---	3	470
M3	2	3	---	430

It is required to determine the daily number of units to be manufactured for each product. The profit per unit for product 1, 2 and 3 is Rs. 4, Rs. 3 and Rs. 6 respectively. It is assumed that all the amounts produced are consumed in the market.

Write the constraints of above Linear Programming Problem.

Answer

Transportation problem is a special class of linear programming problem in which transport a commodity from the source to a destination in such a way that the total transportation cost is maximum

Question No: 48 (Marks: 3)

Express the following Transportation problem(T.P) table into algebraic form with proper objective function and non-negative constraints

	D_1	D_2	D_3	Supply
O_1	c_{11}	c_{12}	c_{13}	5
O_2	c_{21}	c_{22}	c_{23}	3
O_3	c_{31}	c_{32}	c_{33}	10
Demand	4	6	8	

Answer

$$4x + S_2 + D_1 \leq 5$$
$$S_1 + 6y + D_1 \geq 3$$
$$S_1 + S_2 + 8z \leq 10$$

Question No: 49 (Marks: 5)

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Complete the above transportation Model by Vogel Approximation Method. And also find the starting basic feasible solution.

Answer

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Cost = 1 + 2 + 7(6) + 2 + 5(1) = 52
This is the initial basic solution consider u1 = 1 and v1 = 2 and v2 = 3

Question No: 50 (Marks: 5)

Check whether the given initial basic feasible solution is optimal or not.

1	2	6 **7**	**7**
0 **10**	4	2 **2**	**12**
3	1 **10**	5 **1**	**11**
10	**10**	**10**	

Answer

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
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Demand	**10**	**10**	**10**	

Cost = 1 + 2 + 7(6) + 2 + 5(1) = 52
This is the initial basic solution consider u1 = 1 and v1 = 2 and v2 = 3

it is a n optimal solution according to if we put formula

Question No: 51 (Marks: 5)

A company cost Rs. 500 operations and maintenance costs are zero for the first year and increased by Rs. 100 every year. If money is worth 5% every year, calculate present worth (**P(r)**) for each year. The resale value of the machine is negligibly small.

Answer

for each year increase in money = 5%

means to say that company significes 105 ruppes every year the company capital must be increaing as 105 * 500

Question No: 52 (Marks: 5)

Express the following linear programming problem in standard form and also construct its initial simplex table.
Max $Z = 3x+2y$
Subject to constraints:
$x + y \leq 4$
$x - y \leq 2$
$x,y \geq 0$

Answer

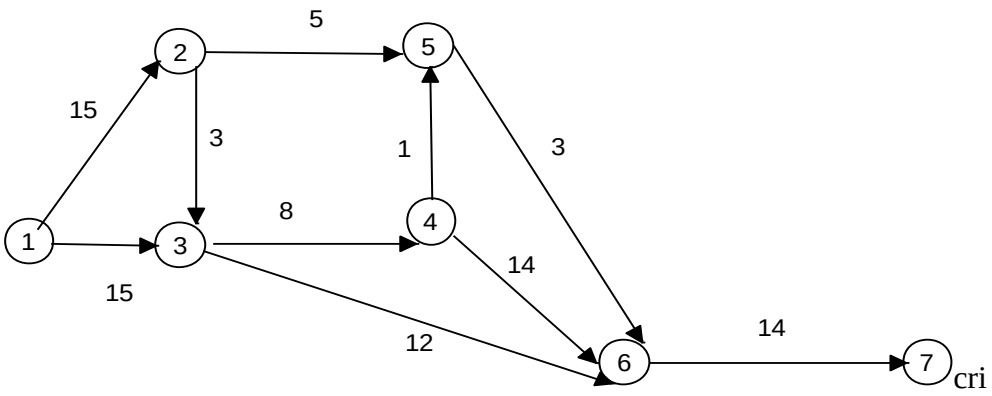
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Assignment # 1

MTH601 (Fall 2014)

Total marks: 10
Lecture: # 01-10
Due date: 26-11-2014

Q 1 For the following project, the network flow diagram and the time durations are given below. Find the critical path.



Q 2 For a project,time estimates are given as follows:

Job	Estimated completion time in days		
	Shortest time	Most likely time	Longest time
A	3	3	3
B	1	4	7
C	3	6	9
D	3	5	7
E	2	2	2
F	3	6	9
G	3	6	9
H	1	4	7
I	4	6	8
J	4	10	18
K	4	6	10
L	2	5	9

Draw the project network and total project duration.

FINALTERM EXAMINATION
Fall 2012
MTH601 - Operations Research

Ref No: 3886822
Time: 120 min

Question No: 1 (Marks: 1) - Please choose one

Which of the following is a characteristic of critical path scheduling techniques?

► The jobs or tasks are dependent on each other
► Interruptions may be permitted if they are documented

Selected answer The jobs or tasks must be well defined, and their completion marks the end of the project

► The jobs or tasks do not necessarily have to be in a predetermined sequence

Question No: 2 (Marks: 1) - Please choose one

During a replacement if the value of money decreases at the rate of **3**% then the present worth factor of unit amount to be spent after one year is given by

► 0.25
► 0.333

Selected answer 0.9708

► 4

Question No: 3 (Marks: 1) - Please choose one

If the money carries a rate of interest of **12**% per year, the present worth factor of one rupee due in one year is

Selected answer 0.08333

► 0.89285
► 0.0769
► 13

Question No: 4 (Marks: 1) - Please choose one

Search and cutting methods are used to solve following types of problems

► Transportation
► Assignment

Selected answer Integer Programming

► Queuing problems

Question No: 5 (Marks: 1) - Please choose one

A feasible solution is called a _____ solution if the number of non negative allocation is equal to "m + n – 1" (Here m is the number of rows, n is the number of columns in transportation problem)

Selected answer basic feasible

- ► non basic feasible
- ► basic infeasible
- ► optimal

Question No: 6 (Marks: 1) - Please choose one

If a basic feasible solution contains less than "m + n – 1" (Here m is the number of rows, n is the number of columns in transportation problem) non negative allocation, then it is said to be

- ► Degenerate
- ► Multiple Solutions
- ► Non degenerate

Selected answer Alternative Optima

Question No: 7 (Marks: 1) - Please choose one

Consider the following cost table

		Destinations			
Source		**D1**	**D2**	**D3**	**Supply**
	S1	5	1	2	**25**
	S2	7	2	4	**10**
	S3	3	3	5	**15**
	Demand	**10**	**20**	**20**	

Using Vogel's Approximation Method, which one is the starting cell?

Selected answer S1 à D1

- ► S3 à D1
- ► S2 à D2
- ► S2 à D1

Question No: 8 (Marks: 1) - Please choose one

		Destinations			
		D1	D2	D3	Supply
Source	S1	5	1	2	25
	S2	7	2	4	10
	S3	3 10	3	5	15
	Demand	10	20	20	

Using Vogel's Approximation Method:
These below are the three cells which can be next cell:

I. S3 → D2
II. S2 → D2
III. S1 → D3

Which one is the correct option?

► I, II and III
► I only
► II only

Selected answer III only

► I and II only

Question No: 9 (Marks: 1) - Please choose one

	D1	D2	D3	Supply
S1	5 10	1 15	2	25
S2	7	2 5	4 5	10
S3	3	3	5 15	15
Demand	10	20	20	

Cost = 10 (5) + 15 (1) + 5 (2) + 5 (4) + 15 (5) = 170

This is the initial basic feasible solution of a question by North – West Corner Method.

Finding optimal basic feasible solution: Consider U1 = 0 and V1 = 5, what is the value of V2?

- ► □
- ► □
- ► □

Selected answer □

Question No: 10 (Marks: 1) - Please choose one

Transportation problem is a special class of linear programming problem in which transport a commodity from the source to a destination in such a way that the total transportation cost is

- ► Zero
- ► Maximum

Selected answer Minimum

- ► Average

Question No: 11 (Marks: 1) - Please choose one

We solve a assignment problem by subtracting least number in each row and we get the table below:

Cost Table	Dist Center D	Dist Center E
Plant A	0	135
Plant B	0	8
Plant C	34	0

After doing next step, which table should be next?

Cost Table	Dist Center D	Dist Center E
Plant A	0	135
Plant B	0	8
Plant C	34	0

▶

Cost Table	Dist Center D	Dist Center E
Plant A	0	127
Plant B	0	0
Plant C	0	0

▶

Cost Table	Dist Center D	Dist Center E
Plant A	135	0
Plant B	8	0
Plant C	0	34

►

Cost Table	Dist Center D	Dist Center E
Plant A	0	0
Plant B	34	8
Plant C	0	135

Selected answer

Question No: 12 (Marks: 1) - Please choose one

The cost matrix in assignment problem is always

Selected answer identity matrix

► zero matrix
► diagonal matrix
► square matrix

Question No: 13 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then the average system time is:

► 1/5

Selected answer 5

► 1

► 2

Question No: 14 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then ρ (traffic intensity or system utilization) =?

► □□□

Selected answer □□□

► □□□

► □□□

Question No: 15 (Marks: 1) - Please choose one

Formula for the expected number in the system L is:

$$L=\frac{\lambda}{\mu-\lambda}$$

►

$$L=\frac{\lambda}{\mu+\lambda}$$

►

$$L=\frac{\lambda}{\lambda-\mu}$$

►

$$L=\frac{\mu}{\mu-\lambda}$$

Selected answer

Question No: 16 (Marks: 1) - Please choose one

If the arrival rate is 5 per hour and the service rate is 10 per hour, then the expected number in the queue or average queue length is:

► □□□

Selected answer □

► □

► □□□

Question No: 17 (Marks: 1) - Please choose one

Total cost per period = Item cost + Order cost + Holding cost + _____.

Selected answer Shortage cost

► Optimum Shortage (S*)

► Economic Oreder Quantity. (Q*)

► Maximum Inventory. ($I_{max.}$)

Question No: 18 (Marks: 1) - Please choose one

In Manufacturing Model with no shortage, the replacement rate is finite and _____ the demand rate.

► greater than

Selected answer less than

► equal to

Question No: 19 (Marks: 1) - Please choose one

If "N*i*" be the Number of replacement made at the end of the i^{th} week and "P*j*" be the probability of failure during the i^{th} week, then N_1 = ----------.

► N_0P_1

Selected answer N_1P_1

► N_0P_0

► N_1P_2

Question No: 20 (Marks: 1) - Please choose one

If "N*i*" be the Number of replacement made at the end of the i^{th} week and "P*j*" be the probability of failure during the i^{th} week, then N_2 = ----------.

► $N_1P_2 + N_1P_1$

► $N_0P_2 + N_1P_1$

► $N_0P_1 + N_1P_2$

► $N_0P_2 + N_1P_2$

Question No: 21 (Marks: 1) - Please choose one

The present worth of a rupee to be spent after a year is denoted by *v* and given by

► $v = (1 + r)$

► $v = (1 / r)$

► $v = (1 + r) / 10$

Selected answer $v = 1/ (1 + r)$

Question No: 22 (Marks: 1) - Please choose one

Formula for a geometric series "$x + vx + v^2x + ... + v^{n-1}x$" is

$$P(n) = \frac{1-v^n}{1-v}$$

Selected answer

$$P(n) = x\frac{1-v}{1-v^n}$$

▶

$$P(n) = \frac{1-v}{1-v^n}$$

▶

$$P(n) = x\ \frac{1-v^n}{1-v}$$

▶

Question No: 23 (Marks: 1) - Please choose one

In replacement Models, Capital Cost = (Item / Machine Cots) – (----------).

▶ Resale Cost

▶ Running Cost

Selected answer Maintenance Cost

▶ Operating Cost

Question No: 24 (Marks: 1) - Please choose one

Formula of EOQ in manufacturing model with shortages is

$$Q^* = \sqrt{2C_2D/C_3(1-D/R)}.\sqrt{C_3+C_4/C_4}$$

▶

$$Q^* = \sqrt{2C_2D/C_3}.\sqrt{R/R-D}$$

Selected answer

$$Q^* = \sqrt{2C_2D/C_3}$$

▶

▶ Non of them

Question No: 25 (Marks: 1) - Please choose one

To identify and maintain the proper precedence relationship between activities those are not connected by event, we introduce

► Parallel Activity

Selected answer Dummy Activity

► Sequential Activity

► None of these

Question No: 26 (Marks: 1) - Please choose one

PERT is based on

► Deterministic times

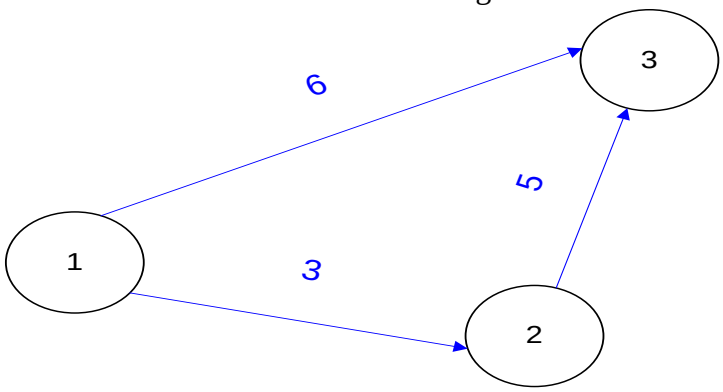
Selected answer Probabilistic Times

► Dummy Times

► Estimated times

Question No: 27 (Marks: 1) - Please choose one

Non-critical activities in the following network are -------



► Activity (1,2)

► Activity (2,3)

Selected answer Dummy Actvity

► Activity (1,3)

Question No: 28 (Marks: 1) - Please choose one

If $t_0 = 10$, $t_m = 10$ and $t_p = 16$, then *S.D* = _____.

► □□

► □□□
► □
Selected answer □□

Question No: 29 (Marks: 1) - Please choose one

Which of the following is an essential characteristic of a linear programming problem?

► The relationship between variables and constraints must be linear
► The model must have an objective function
► The model must have structural constraints
Selected answer All are equivalent

Question No: 30 (Marks: 1) - Please choose one

In the simplex table for a linear programming problem, we select the leaving basic variable corresponds to ----------
► Maximum non-negative ratio
► Maximum negative ratio
Selected answer Minimum non-negative ratio
► Minimum negative ratio

Question No: 31 (Marks: 1) - Please choose one

A technique for solving a linear programming problems in which artificial variables are included with coefficients of very large number say equal 10 times of any cost coefficient of decision variables is known as ---------
► Big M – Method.
► Least Cost Method
♦♏●♏♍♦♏♎ ♋■♦♦♏❒ Hungarian Method
Branch and Bound Method

Question No: 32 (Marks: 1) - Please choose one

If the _____ variables appear in the final basic set, then the LP (Linear Program) has no solution.
► slack
► surplus
► non – basic
Selected answer artificial

Question No: 33 (Marks: 1) - Please choose one

If no _____ variable appears in the basis and the optimality conditions are satisfied, then the current solution will be optimal one.

► artificial

Selected answer non basic

► slack

► surplus

Question No: 34 (Marks: 1) - Please choose one

Min. Z = 0 and no artificial variable appears in the basic variables. _____ solution to original problem has been found and we proceed to phase II method.

► A basic feasible

► An optimal

Selected answer An infeasible

Question No: 35 (Marks: 1) - Please choose one

In Two – Phase method, if all the _____ variables become zero, we stop the phase I and proceed to phase-II.

► artificial

Selected answer basic

► non basic

► positive slack

► negative slack

Question No: 36 (Marks: 1) - Please choose one

The inequality $2x+3y\leq 18$ is equivalent to

► $2x+3y\leq -18$

Selected answer $-2x-3y\geq 18$

► $-2x-3y\geq -18$

► $-2x-3y\leq -18$

Question No: 37 (Marks: 1) - Please choose one

Which of the following order pair would minimize the objective function of the linear programming problem; z = x + y subject to x≥3, y≥0 ?

► (3,3)

Selected answer (3,0)

► (0,3)

► (0,0)

Question No: 38 (Marks: 1) - Please choose one

In which of the following models, Simplex algorithm is not preferred to use due to laborious computations?

► Transportations models

► Degenerate Linear models

► Non-degenerate Linear models

Selected answer Dual or unbounded linear models

Question No: 39 (Marks: 1) - Please choose one

Transportations models consist of ------- like the production centers and --------- which may be the sales centers.

► (sinks, sources)

► (sources, sinks)

Selected answer (origins, sources)

► (sinks, destinations)

Question No: 40 (Marks: 1) - Please choose one

To convert the transportation problem into a maximization model we have to----------.

► write the inverse of the coefficient matrix
► multiply the feasibility condition by –1
► multiply the coefficient matrix by –1

Selected answer We can't convert the transportation problem into a maximization problem, as it is basically a minimization problem.

Question No: 41 (Marks: 2)

A branch of Punjab National Bank has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8 – hour worki9ng day. If the typewriter is valued at Rs. 1.50 per hour, Determine

Average system time.

Answer

Not Attempted

Question No: 42 (Marks: 2)

An oil company has 8 unit of money available for exploration of three sites. If oil is present at a site, the probability of finding it depends upon the amount allocated for exploiting the site as given below:

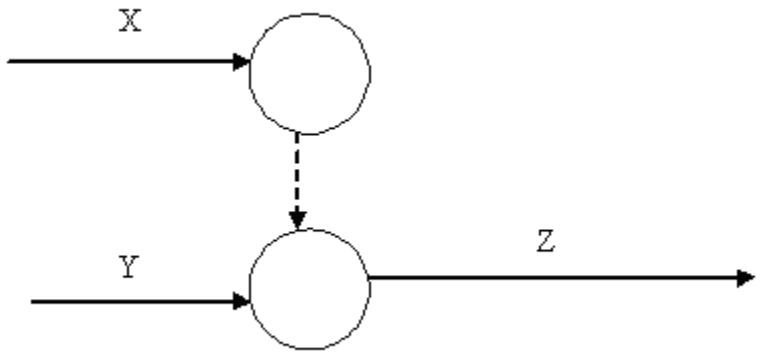
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Site I	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.0
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Site III	0.0	0.1	0.1	0.2	0.3	0.5	0.8	0.9	1.0

The probability that the oil exits at sites I, II and III is 0.4, 0.3 and 0.2 respectively; we have to find the optimal allocating of money.
Do stage I only.

Answer

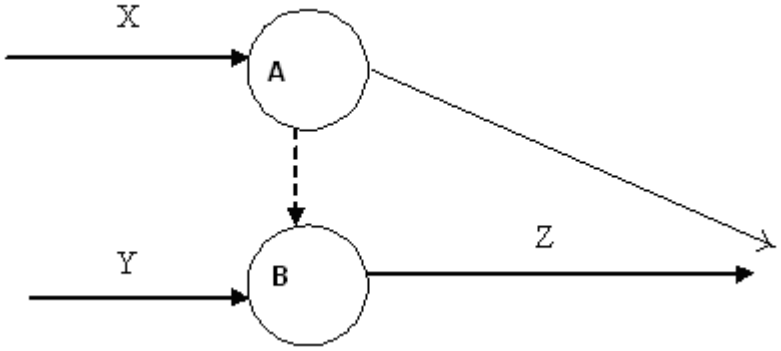
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Question No: 43 (Marks: 2)



Write the relationship between the activities.

Answer



X approches to Y
X also approches to Z
Y approches to Z
whether A and b might have the values between the centre points

Question No: 44 (Marks: 2)

For the mathematical form of a Transportation problem(T.P):

$$\min z = \sum_{i=1}^{i=m} \sum_{j=1}^{j=n} c_{ij} x_{ij} \quad -----(1)$$

subject to

$$\sum_{j=1}^{j=n} x_{ij} = a_i \text{ -----(2)} \ , i = 1, 2, \ldots, m(\text{Sources})$$

$$\sum_{i=1}^{i=m} x_{ij} = b_j \text{ -----(3)} \ , i = 1, 2, \ldots, n(\text{Destinations})$$

Describe the practical significance of all the above equations(1), (2) and (3).

Answer

Not Attempted

Question No: 45 (Marks: 3)

The milk plant at a city distributes its products by trucks, located at the loading dock. It has its own fleet of trucks plus trucks of a private transport company. This transport company has complained that sometimes its trucks have to wait in line and thus the company loses money paid for a truck and driver that is only waiting. The company has asked the milk plant management either to go in for a second loading dock or discount prices equivalent to the waiting time, the following data available

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The transport company has provided 40%of the total number of trucks. Assuming that these rates are random according to Poisson distribution, determine

a) The probability that a truck has to wait.

b) The waiting time of a truck that waits.

Answer

The probability that a truck has to wait.

$$\frac{\mu}{\mu - \lambda} = \frac{4}{4-3} = \frac{4}{1} = 4$$

The waiting time of a truck that waits.

round about 40 minutes of each truck.

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Years.	1	2	3	4	5	6
Maintenance Cost.	4500	4700	5000	5500	6500	7500
Resale Value	27000	25300	24000	21000	18000	13000

Determine capital cost for each year.

Answer

Item / machine cost - resale cost - maintenace cost = capital cost
30000 - 13000 - 7500 => 17000-7500 = 9500
machine capital cost for year 7 is 7500

Question No: 47 (Marks: 3)

A firm produced three products. These products are processed on three different machines. The time required to manufacturer one unit of each of the three products and the daily capacities of the three machines are given in the table:

Machines	Time per unit (minutes)			Machine Capacity (minutes / day)
	Product 1	Product 2	Product 3	
M1	2	3	2	440
M2	4	---	3	470
M3	2	3	---	430

It is required to determine the daily number of units to be manufactured for each product. The profit per unit for product 1, 2 and 3 is Rs. 4, Rs. 3 and Rs. 6 respectively. It is assumed that all the amounts produced are consumed in the market.

Write the constraints of above Linear Programming Problem.

Answer

Transportation problem is a special class of linear programming problem in which transport a commodity from the source to a destination in such a way that the total transportation cost is maximum

Question No: 48 (Marks: 3)

Express the following Transportation problem(T.P) table into algebraic form with proper objective function and non-negative constraints

	D_1	D_2	D_3	Supply
O_1	c_{11}	c_{12}	c_{13}	5
O_2	c_{21}	c_{22}	c_{23}	3
O_3	c_{31}	c_{32}	c_{33}	10
Demand	4	6	8	

Answer

$$4x + S_2 + D_1 \leq 5$$
$$S_1 + 6y + D_1 \geq 3$$
$$S_1 + S_2 + 8z \leq 10$$

Question No: 49 (Marks: 5)

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Complete the above transportation Model by Vogel Approximation Method. And also find the starting basic feasible solution.

Answer

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Cost = 1 + 2 + 7(6) + 2 + 5(1) = 52
This is the initial basic solution consider u1 = 1 and v1 = 2 and v2 = 3

Question No: 50 (Marks: 5)

Check whether the given initial basic feasible solution is optimal or not.

1	2	6 **7**	**7**
0 **10**	4	2 **2**	**12**
3	1 **10**	5 **1**	**11**
10	**10**	**10**	

Answer

	1	**2**	**3**	**Supply**
1	1	2	6 **7**	**7**
2	0 **10**	4	2	**12**
3	3	1	5 **1**	**11**
Demand	**10**	**10**	**10**	

Cost = 1 + 2 + 7(6) + 2 + 5(1) = 52
This is the initial basic solution consider u1 = 1 and v1 = 2 and v2 = 3

it is a n optimal solution according to if we put formula

Question No: 51 (Marks: 5)

A company cost Rs. 500 operations and maintenance costs are zero for the first year and increased by Rs. 100 every year. If money is worth 5% every year, calculate present worth (**P(r)**) for each year. The resale value of the machine is negligibly small.

Answer

for each year increase in money = 5%

means to say that company significes 105 ruppes every year the company capital must be increaing as 105 * 500

Question No: 52 (Marks: 5)

Express the following linear programming problem in standard form and also construct its initial simplex table.
Max $Z = 3x+2y$
Subject to constraints:
$x + y \leq 4$
$x - y \leq 2$
$x,y \geq 0$

Answer

Blank Data

MTH601-Midterm (June 7, 2014)

Question: (2 marks)
What is linear Programming?

Question: Forgot ☹

Question: (3 marks)
If we increase the inventory, then what would be the proportionate effect on the followings? Give proper reason in each case.
(i) Shortage Cost.
(ii) Ordering or Setup Cost per unit time.
(iii) Holding Cost.

Question: (3 marks)
Put the following program in standard form

$$\textit{Maximize. } Z = x + y$$

$$\textit{Subject to}:$$

$$x + 5y \leq 5$$

$$2x + y \leq 4$$

$$x, y \geq 0$$

Question:
Find the initial basic feasible solution to the following linear programming problem,
Maximize $\boldsymbol{Z} = 4\boldsymbol{x} + \boldsymbol{y}$
Subject to
$3\boldsymbol{x} + \boldsymbol{y} = 3$
$2\boldsymbol{x} + \boldsymbol{y} \geq 6$
$\boldsymbol{x} + 2\boldsymbol{y} \leq 3$
$\boldsymbol{x}, \boldsymbol{y} \geq 0$

Question: (5 marks)
Classify the following material items into ABC categories.

Item Number	1	2	3	4	5	6	7
Annual Usage in Rs.	36000	14000	75000	37000	11000	16000	32000