

Printed Pages—7

EOE073

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2786

Roll No.

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B.Tech.

(SEM. VII) ODD SEMESTER THEORY

EXAMINATION 2013-14

OPERATIONS RESEARCH*Time : 3 Hours**Total Marks : 100*

- Note :-** (i) Attempt all questions.
(ii) All questions carry equal marks.
(iii) Be precise in your answer.

1. Answer any **four** of the following :
- (a) Define Operations Research and discuss its scope in modern management.
 - (b) Discuss the methodology of Operations Research explaining briefly the main phases of an Operations Research study.
 - (c) Explain the characteristics of linear programming problem.

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- (d) Solve the following problem with the help of Simplex Method :

$$\text{Maximize } 3x_1 + 4x_2$$

$$\text{subject to } 1x_1 + 1x_2 \leq 450$$

$$2x_1 + 1x_2 \leq 600$$

$$x_1, x_2 \geq 0.$$

- (e) Find the range of the coefficient of X (profit contribution) in the objective function for which the solution (quantity of two products) remains unaltered to the following problem :

$$\text{Maximize } 40X + 35Y$$

$$\text{subject to } 2X + 3Y \leq 60$$

$$4X + 3Y \leq 96$$

$$X, Y \geq 0.$$

- (f) Find the dual of the following problem :

$$\text{Minimize } 3a + 2.5b$$

$$\text{subject to } 2a + 4b \geq 40$$

$$4a + 2b \geq 50$$

$$a, b \geq 0$$

2. Answer any two of the following :

- (a) Show that the transportation problem is a special case of linear programming problem.
- (b) The cost of transporting one unit from the sources to destinations, source capacity and destination requirements are given in the following table. Find the optimal schedule :

Source	Destinations			Source capacity
	D ₁	D ₂	D ₃	
S ₁	27	23	30	80
S ₂	10	40	45	50
S ₃	20	55	30	70
Requirements	35	60	55	

- (c) The table shown below is a profit matrix. Find the optimum assignment schedule to maximize the profit :

Job	1	2	3	4	5
M/c					
A	5	11	10	12	4
B	2	4	6	3	5
C	3	12	5	15	6
D	6	15	4	11	7
E	7	9	8	12	5

3. Answer any two of the following :

(a) Explain the following :

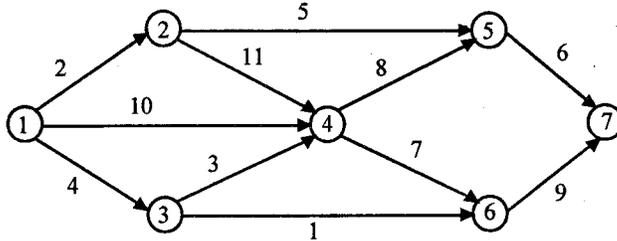
- (i) Minimum spanning tree problem and the steps of solving such problems.
- (ii) Fulkerson's rule for numbering the events of a network with suitable examples.

(b) A project has these activities, precedence relationships and activity duration in days.

Activity	Immediate predecessor activities	Duration
a	—	10
b	—	15
c	a	10
d	a	20
e	c	15
f	b	17
g	b	12
h	d, f	9
i	g, h	7

Construct a CPM Network for the project, and compute free float for each activity.

- (c) Consider the network shown below. Node 1 is the starting node and node 7 is the terminal point. The distances d_{ij} between nodes i and j are given directly on each arc. Compute shortest distance and its designated route to node 7. Show the computational work at every step.



4. Answer any two of the following :

- (a) Two players P and Q play a game where each of them has to choose one of the three colours white (W), black (B) and red (R) independently of the other. The complete pay-off matrix is shown below. Find the optimum strategy for P and Q and the value of the game.

		Colour chosen by Q		
		W	B	R
Colour chosen by P	W	0	-2	7
	B	2	5	6
	R	3	-3	8

- (b) Arrival rate of telephone calls at a telephone booth is according to Poisson distribution with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed with mean 3 minutes. Find :
- (i) The probability that a person arriving at the booth will have to wait.
 - (ii) Find the average queue length that is formed from time to time.
 - (iii) Telephone Company will install a second booth when convinced that an arrival would expect to have to wait at least 4 minutes for the phone. Find the increase in flow of arrivals which will justify a second booth.
- (c) Explain the following :
- (i) Pure strategy, mixed strategy, and saddle point in a two person zero-sum game.
 - (ii) The important characteristics of queuing system.
5. Answer any **two** of the following :
- (a) Show that the minimum total annual inventory cost for economic order quantity is $\sqrt{(2AHD)}$.
- Where A = ordering cost; Rs./order
 H = inventory carrying cost per item per year
 D = demand rate; units per year
- State clearly the assumptions made.

- (b) The initial price of an equipment is Rs. 5,000/-. The running cost varies as shown below :

Year	1	2	3	4	5	6	7
Running cost (Rs.)	400	500	700	1000	1300	1700	2100

Find out the optimum replacement period, taking a discount rate of 0.9.

- (c) Explain the following :
- Explain ABC analysis with procedural steps
 - Discuss quantity discount model.