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

PAPER ID : 2786 Roll No. | | | | | | | | | | |

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.

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

Maximize $3x_1 + 4x_2$

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 :

Maximize $40X + 35Y$

subject to $2X + 3Y \leq 60$

$4X + 3Y \leq 96$

$X, Y \geq 0.$

(f) Find the dual of the following problem :

Minimize $3a + 2.5b$

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 / M/c	1	2	3	4	5
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.

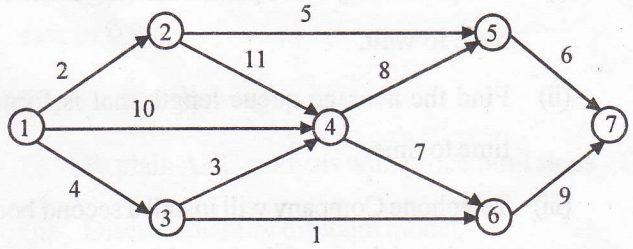
(ii) Fulkerson's rule for numbering the events of a network with suitable examples.

(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 :

(i) Explain ABC analysis with procedural steps

(ii) Discuss quantity discount model.