PROD / VI / Operation Research (OR) / 22/05/15. PROD

QP Code : 5031

PEC603

Duration:03Hours. **Total Marks assigned to the paper: 80**

Instructions to the candidates, if any,:---

N.B. : 1) Question No. 1 is compulsory.

2) Attempt any THREE questions out of remaining FIVE questions.

3) Assume suitable data wherever necessary.

QNo.1 **Solve any FIVE questions:** **4*5=20**

a) List the advantages, limitations and applications of linear programming?
b) Explain dynamic programming and state its applications?
c) State and explain basic elements of queues?
d) Generate a sequence of five two digit random numbers using mixed congruential generator with a=7, c=13 and the seed =11
e) Explain the terms: pure strategy, mixed strategy, saddle point and payoff matrix.
f) Five jobs are performed first on machine M_1 and then on M_2. Time in hours taken by each job on each machine is given below:

Machines	Jobs				
	A	B	C	D	E
M_1	5	1	9	3	10
M_2	2	6	7	8	4

QNo.2 **13**

a) A manufacturing company produces two products A and B. each product undergoes two operations on machines M_1 and M_2. The time required to perform these operations with the available capacity of machines M_1 and M_2 in a given quarter are given below. The market survey has predicted that not more than 450 units of product A and not more than 250 units of product B can be sold in a given quarter. The company wants to determine the product mix to maximize profit. The unit profits for products A and B are Rs. 20 and Rs. 40 respectively. Formulate the model and solve by simplex method.

Machine	Product time required per unit		Available capacity(hrs.)
	A	B	
M_1	1.5 hrs.	1hr.	750
M_2	1hr.	3hrs.	900
Profit	Rs.20	Rs.40	

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b) Solve using Big-M mehod: 7

Maximise: $z = 3x + 2y$

Subjected to:

$2x + y \leq 2$

$3x + 4y \geq 12$

$X, y \geq 0$

QNo.3 a) Consider the problem of assigning I five jobs to five persons. The assignment costs are given below: 10

	Jobs					
persons		1	2	3	4	5
	A	8	4	2	6	1
	B	0	9	5	5	4
	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

b) A company has three plants A, b and C and three ware houses P, Q and R. the transportation cost per unit, demand of each ware house and capacity of each plant are as given in the table below. Find the optimum transportation plan: 10

Plant	Warehouse			Capacity
	P	Q	R	
	Transportation cost(Rs.)			
A	50	80	100	400
B	22	90	40	500
C	70	100	55	300
Demand	400	400	400	

QNo.4 a) A super market has two sales girls at the sales counters. If the service time for each customer is exponential with a mean of 4 minutes and if the people arrive in a Poisson fashion at the rate of 10 an hour. Calculate: 10

i) probability that there is no customer in the system,

ii) average no. of customers in the queue,

iii) average no. of customers in the system,

iv) average waiting time in the queue,

v) utilization factor

b) For the given game below determine the optimal strategies for A by graphical method: 10

	B		
		I	II
A	I	4	2
	II	3	8
	III	2	12

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QNo.5 — 10

a) The manager of a book depot has to decide the number of copies of a particular book to order. A book costs Rs. 60 and Rs. 80. since some of the topics change year after year any copies unsold while the edition is current must be sold for Rs. 30. From past records the distribution of the demand for this book has obtained as follows:

Demand(no. of copies) :	15	16	17	18	19	20	21	22
Proportion	0.05	0.08	0.2	0.45	0.1	0.07	0.03	0.02

Using the following random numbers generate data on demand for 20 time periods (years) calculate the average profit obtainable under each of the courses of action open to the manager.

b) The profit for three markets as a function of sales effort expended is given in the table below. How will you distribute a given number of salesmen so as maximize the profit: — 10

No. of salesman	Markets		
	I	II	III
0	40	50	50
1	42	60	60
2	50	65	70
3	60	75	80
4	66	85	88
5	75	95	105
6	82	110	115
7	90	120	130

QNo.6 — 10

a) The following table gives the activities in a project and other related information:

Activity	Duration
1- 2	3
2-3	6
2-4	7
2-5	8
3-4	2
4-5	5

Construct the network diagram and find the critical path. Also find the total float and free float for each activity. Find the total project duration.

b) Write short notes on any two: — 10

i) Replacement models

ii) Bellman's principle of optimality

iii) Sensitivity analysis
