26-03-17

Q.P. Code :18293

[Time: Three Hours]   [Marks:80]

Please check whether you have got the right question paper.

N.B: 1.   Q. No. 1 is compulsory.
        2.   Attempt any THREE questions out of remaining five questions.
        3.   Assume suitable data wherever necessary.

Q.1   Attempt any FOUR questions.   5*4=20

  a) Briefly explains the reasons for replacement of equipment?

  b) Explain dynamic programming and state its applications?

  c) How assignment models are different from transportation models?

  d) Generate a sequence of five two digit random numbers using mixed congruence generator with
     a = 21, b = 53 , seed = 46 and m=100.

  e) Briefly explain following terms with respect to waiting lines: waiting time; service time; waiting
     time in the system; queue length; system length.

  f) Five jobs are performed first on machine X and then on Y. Time in hours taken by each job on
     each machine is given below:

Machines	Jobs				
	A	B	C	D	E
X	12	4	20	14	22
Y	6	14	16	18	10

    Determine the optimum sequence of job that minimizes the total elapsed time to complete the
    Jobs.

Q.2   a) A firm is engaged in breeding pigs. The pigs are fed on various products grown on the farm. In   10
         view of the need to ensure certain nutrient constituents it is necessary to buy two products say
         A and B in addition. The contents of various products per unit in nutrient constituents are given
         in the following table:

Nutrients	Nutrient content in the product		Minimum amount of nutrient required
	A	B	
M_1	36	6	108
M_2	3	12	36
M_3	20	10	100

    If product A costs Rs 20and B Rs 40 per unit, how much each of these two products should be
    bought so that total cost is minimum. Solve the problem by graphical method.

  b) Solve using Two Phase method: 10
        Minimize: $Z = 12X_1 + 20X_2$
     Subjected to:
        $6X_1 + 8X_2 \geq 100$
        $7X_1 + 12X_2 \geq 120$
        $X_1, X_2 \geq 0$

TURN OVER

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Q.3 a) A captain of a cricket team has to allot five middle order batting positions to five batsmen. 10
The average runs scored by each batsman at these positions are given in the table:

Batsmen		Batting Position				
		III	IV	V	VI	VI
	A	40	40	35	25	50
	B	42	30	16	25	27
	C	50	48	40	60	50
	D	20	19	20	18	25
	E	58	60	59	55	53

Make the assignment so that the expected total average runs scored by these batsmen are maximum.

b) A company has three plants A, b and C and three ware houses P, Q and R. the transportation 10
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:

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	

Q.4 a) A super market has two sales girls at the sales counters. If the service time for each customer is 10
exponential with a mean of 4 minutes and if the people arrive in a Poisson fashion at the rate of
10 an hour. Calculate:
1. Probability that there is no customer in the system,
2. Average no. of customers in the queue,
3. Average no. of customers in the system,
4. Average waiting time in the queue,
5. Utilization factor

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

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

Q.5 a) The manager of a book depot has to decide the number of copies of a particular book to order. A 10
book costs Rs. 60. 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 10 time periods (years)
48, 51, 06, 22, 79, 56, 06, 91, 51, 13.Calculate the average profit obtainable under each of the
courses of action open to the manager.

TURN OVER

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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

Q.6 a) The following table gives the activities in a project and other related information: 10

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

1. Replacement models
2. Bellman's principle of optimality
3. Sensitivity analysis

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