08/06/17

Sem VII/CBSGS/Auto/OR/M-J-17

Q.P.Code: 018190

(3 Hours) [Total Marks: 80]

N.B. (1) Question number 1 is compulsory and answer any three from the remaining.

(2) Graph paper should be given on demand.

(3) Digits in the right indicates full marks.

Q.1. (a) Assign the four subjects to three faculty members. Students have to study One subject on their own. The matrix given below indicates the marks score and the objective is to score maximum marks. **(5)**

Faculty	Subjects			
	S1	S2	S3	S4
P1	60	40	70	50
P2	45	55	65	60
P3	30	35	55	50

(b) What is Monte Carlo simulation technique. How it will be applicable in solving Queuing problem. **(5)**

(c) Write Dual of the following LPP **(5)**

Maximize $Z = 3x + 5y + 4z$

Subject to

$3x + 2y + 2z \leq 12$

$2x + 2y + z \geq 8$

$x + 2y + 3z = 15$

$x, y \geq 0$

(d) Write short note on resource leveling. **(5)**

Q.2. (a) Explain the following terms with suitable examples – infeasible solution and unbounded solution in the context of Linear Programming Problem. **(4)**

(b) Solve the following game and find the value of game. **(6)**

	1	2	3	4	5
I	1	3	2	7	4
II	3	4	1	5	6
III	6	5	7	6	5
IV	2	0	6	3	1

(c) Solve the following LPP (10)

Maximize,

$$Z = 16 X_1 + 17 X_2 + 10 X_3$$

Subject to,

$X_1 + X_2 + 4X_3 \leq 2000$; $2X_1 + X_2 + X_3 \leq 3600$;

$X_1 + 2 X_2 + 2 X_3 \leq 2400$; X_1, X_2 & $X_3 \geq 0$

Q.3 (a) Nagpur Orange Grower Association has three canning factories. Oranges are transported from three Orchards. Transportation costs per ton, capacities of Orchards and requirements of factories are given in the table. Determine the optimal transportation Mix. (10)

	Factories			Capacity
Orchards	**1**	**2**	**3**	**4**
A	3	7	8	30
B	1	4	8	30
C	5	2	5	40
D	10	3	2	50
Requirements	20	60	70	

(b) For a given network data, draw the network, determine the total float, independent and interfering floats and identify the critical path. (10)

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	2	8	10	6	3	3	7	5	2	8

Q.4. (a) At a booking window customers arrive at the rate of 10 per minute approximated to Poisson's distribution. If the service time is exponentially distributed with a mean of 15 per minute, determine (10)

a) Probability that booking clerk waits for the customer

b) Probability that there are at least 3 customers in the queue

c) Average number of customers in the system

d) Average time spent in the queue

e) Probability that the customers will be served within four minutes

(b) Solve the following game. Find the strategies and value of game. (10)

Player A	**Player B**			
	A	**B**	**C**	**D**
P	3	2	4	0
Q	3	4	2	4
R	4	2	4	0
S	0	4	0	8

Q.5. (a) A company manufactures 30 units per day. Sale of these items depends upon demand which has the following distribution:

Sales (units)	27	28	29	30	31	32
Probability	0.10	0.15	0.20	0.35	0.15	0.05

Production cost and sales price of each unit are Rs.40 and Rs.50 respectively. Any unsold product is to be disposed off at a loss of Rs.15 per unit. There is penalty of Rs.5 per unit if the demand is not met. Using the following random numbers estimate the total profit / loss for the next ten days: 10, 99, 65, 99, 95, 01, 79, 11, 16, 20. **(10)**

(b) A Company has a demand of 12,000 units/year for an item and it can produce 2,000 such items per month. The cost of one set up is Rs. 400 and the holding cost/units/month is Rs. 0.15 Find the optimum Lot size and total cost per year, assuming the cost of one unit as Rs. 4. Also find the maximum inventory, manufacturing time and total time. **(10)**

Q.6. (a) Solve the following LPP by Graphical Method **(05)**

Maximize $Z = 8x + 16y$

Subject to

$x+y \leq 200; 3x + 6y \leq 900; y \leq 125;$

$x,y \geq 0$,

(b) A newspaper boy has the following probabilities of selling a magazine: **(10)**

No. of copies sold	10	11	12	13	14
Probability	0.10	0.15	0.20	0.25	0.30

Cost of copy is 30 paise and sale price is 50 paise. He cannot return unsold copies. How many copies should he order?

(c) Explain different behavior of server and customers in the queue. **(05)**
