

Total No. of Questions : 12]

SEAT No. :

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[4859]-220

[Total No. of Pages :4

B.E. (Computer)

b-OPERATIONS RESEARCH

(2008 Course) (Elective-IV) (410452) (Semester-II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer 3 questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION-I

Q1) a) Explain briefly the major phases of operations research. **[8]**

- b) A doctor recommends two foods F1 and F2 to a patient for his diet which includes at least 1000 units of vitamin, 850 units of protein and 700 unit of fat. Each unit of food F1 contains 15 units of vitamin, 18 units of protein, 12 units of fat. Each unit of food F2 contains 22 units of vitamin, 15 units of protein and 16 units of fat. cost of F1 and F2 is R.s 5/- and Rs 8/- respectively. Formulate the problem as LPP to obtain the minimized cost for a diet. **[10]**

OR

Q2) a) Solve the following LPP using the simplex method. **[10]**

$$\begin{aligned}\text{Max } Z &= 2x_1 - x_2 + x_3 \\ \text{Subject to } 3x_1 + x_2 + x_3 &\leq 60 \\ x_1 - x_2 + 2x_3 &\leq 10 \\ -x_1 - x_2 + x_3 &\geq -20 \\ x_1, x_2, x_3 &\geq 0\end{aligned}$$

- b) What are limitations of Graphical method? **[8]**

P.T.O.

Q3) a) Box 1 contains 2000 Bulbs of which 5% are defective. Box2 contains 500 bulbs of which 40% are defective. Box 3 and Box 4 contains 1000 bulbs each with 10% defective. A Box is selected at random and a bulb is selected as random . **[8]**

i) What is probability that selected bulb is defective?

ii) If bulb is defective. What is probability that it is selected from box 2?

b) What is Normal Distribution? Explain central limit theorem and standard normal random variable. **[8]**

OR

Q4) a) What are the limitations of the game theory? **[8]**

b) A newspaper distributor distributes a particular newspaper in a local market. Purchase price of newspaper is 1.05 Rs and selling price 1.50 Rs/-. An unsold copy is disposed of in the recuse market at 0.05/- Rs. The estimates for number of copies in demand is given as follows.

Demand	15	16	17	18	19	20
Probability	0.04	0.19	0.33	0.26	0.11	0.07

How many copies of newspaper should the distributor order so that the expected profit is maximum? Find the maximum expected profit. **[8]**

Q5) a) List and explain performance measure of a queuing system. **[8]**

b) A car park contains 5 cars. The arrival of cars is poisson at a mean rate of 10 per hour. The length of time each car spends in the car park is exponential distribution with a mean of 5 hours. How many cars are in the car park on an average? **[8]**

OR

Q6) a) Describe Kendall notations of queuing models classification. **[8]**

b) A super market has two girls ringing up sales at counters. If the service time from each customer is exponential with a mean of 4 minutes and if possible arrive in a poisson fashion at the rate of 10 an hour, then find. **[8]**

i) What is the probability of having an arrival has to wait for service?

ii) What is the expected percentage of idle time for each girl?

SECTION-II

Q7) a) Explain following terminologies used in solving sequencing problems.[10]

- i) No. of machines.
- ii) Processing order.
- iii) Total Elapsed time
- iv) Idle time on a machine.
- v) No passing Rule.

b) Solve following sequencing problem to minimize the total elapsed time.[8]

Job →	I	II	III
Department ↓			
A	8	6	5
B	8	3	4

OR

Q8) a) Describe Johnson's Algorithm for processing 'N' jobs through two machines. [10]

b) A company has two machines M_1 and M_2 , on which six jobs are to be processed in the order M_1 and M_2 . The processing time (in hours) for each job on these machines is as follows. [8]

Jobs →	J_1	J_2	J_3	J_4	J_5	J_6
Machines ↓						
M_1	1	3	8	5	6	3
M_2	5	6	3	2	2	10

Find optimal job sequence, total elapsed time, idle time for each machine M_1 and M_2 .

Q9) a) Explain mathematical formulation of non linear programming. [8]

b) Solve following non linear programming problem [8]

$$\begin{aligned} Z_{\min} &= 4x_1 + 9x_2 - x_1^2 - x_2^2 \\ \text{Subject to} \quad &4x_1 + 3x_2 = 15 \\ &3x_1 + 5x_2 = 14 \\ &x_1, x_2 \geq 0 \end{aligned}$$

OR

Q10)a) Explain mathematical formulation of Geometric programming problem. [8]

b) Describe the process of piecewise linear approximation of non linear programming. [8]

Q11)a) List and explain various features of dynamic programming. [8]

b) Discuss specific models of dynamic programming. [8]

OR

Q12)a) List and explain applications of Dynamic programming. [8]

b) Write a short note on Equipment replacement problem. [8]

