Total No. of Questions : 12]

SEAT No. :

P862

[Total No. of Pages : 4

[4659] - 242
B.E (Computer Engineering)
OPERATION RESEARCH
(2008 Pattern) (Elective - IV) (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 whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is meant by the term 'feasible region'? Why must this be well defined boundary for the maximization problem? **[6]**

b) Solve the following LP problem graphically and state what your solution indicate. **[10]**

i) Min $Z = 4X_1 - 2X_2$

Subject to $X_1 + X_2 \leq 14$

$3X_1 + 2X_2 \geq 36$

$2X_1 + X_2 \leq 24$

And $X_1, X_2 \geq 0$

ii) Max $Z = 3X + 2Y$

Subject to $-2X + 3Y \leq 9$

$3X - 2Y \leq -20$

And $X, Y \geq 0$

OR

Q2) a) Define slack and surplus variables in a linear programming problem. **[6]**

b) Solve the following LP problem graphically and state what your solution indicates. **[10]**

i) Min $Z = 20X_1 + 10X_2$

Subject to $X_1 + 2X_2 \leq 40$

$3X_1 + X_2 \geq 30$

$4X_1 + 3X_2 \geq 60$

And $X_1, X_2 \geq 0$

P.T.O.

ii) Max $Z = 6X - 4Y$

Subject to $2X + 4Y \leq 4$

$4X + 8Y \geq 16$

And $X, Y \geq 0$

Q3) a) A baking company sells one of its types of cake by weight. It makes profit of Rs. 2 a kg on every Kg of cake sold on the day it is baked. It disposes of all cakes not sold on the day they are baked at a loss of Rs. 0.50 a Kg. If the demand is known to have probability density function $f(R) = 0.3\text{-}0.0003$, find the optimum amount of cake the company should bake daily. **[10]**

b) Explain the following with respect to probability **[6]**

i) random variable

ii) probability distribution function

iii) transition probability.

OR

Q4) a) The probability distribution of demand of an item is as follows **[10]**

Monthly demand	0	1	2	3	4	5
Probability	0.1	0.2	0.2	0.3	0.1	0.1

The cost of carrying inventory is Rs. 1 per unit per month. The current policy is to maintain a stock of three items at the beginning of each month. Assuming that this is the optimum level, calculate the shortage cost of one item for one time unit.

b) For events A and B in the probability. **[6]**

Show that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

Q5) a) Four counters are being opened on the border of a country for checking the passport and necessary papers of the tourists. The tourist chooses a counter at random. If arrivals at the border are Poisson at rate λ and the service time is exponential with parameters $\lambda/2$. What is the steady state average queue at each counter? **[10]**

b) Describe the general problem of M/M/k queuing and deduce an explicit expression for the steady state probability of the length of the queue in an M/M/l system. **[8]**

OR

Q6) a) A telephone exchange has two long distance operators. The telephone company finds that during the peak load, long distance call arrive in a Poisson fashion at an average rate of 15-per hours. The length of service on these calls is approximately exponentially distributed with mean length of 5 minutes. What is the probability that a subscriber will have to wait for his long distance call during the peak hours of a day? **[10]**

b) State the basic axioms governing Poisson queues. Find the distribution of arrival for the Poisson queues. **[8]**

SECTION - II

Q7) a) Find an optimal sequence for the following sequencing problem of four jobs and five machines of which processing time is as follows: **[12]**

Job	1	2	3	4
Machine M_1	6	5	4	7
Machine M_2	4	5	3	2
Machine M_3	1	3	4	2
Machine M_4	2	4	5	1
Machine M_5	8	9	7	5

Also find the total elaspsed time.

b) What do you understand by the following terms in the context of sequence of jobs: **[6]**

i) job arrival pattern

ii) number of machines

iii) the flow pattern in the shop

iv) the criteria of evaluating performance of a schedule.

OR

Q8) a) Five jobs have to be processed on same machine. The set up time for each job depends on the job processed earlier. A table of the set up time is shown below. Find a sequence for processing all jobs that minimizes the total set up cost. **[12]**

Predecessor Job	Follower Job				
	A	B	C	D	E
A	0	29	20	18	24
B	0	0	14	19	16
C	0	35	0	37	26
D	0	15	10	0	10
E	0	18	16	40	0

b) By using appropriate notion, obtain formulae for the following. **[6]**

i) waiting time of job

ii) mean flow time

iii) completion time of a job

Q9) Explain the following with respect to separable programming: **[16]**

a) separable programming problem

b) separable convex problem

c) separable function

d) reduction to separable form

OR

Q10) When $n > m+1$, solve the following NLP problem **[16]**

Minimize $f(x)\, 5x_1\, x_2^{-1} + 2x_1^{-1}\, x_2 + 5x_1 + x_2^{-1}$

Using the geometric programming method.

Q11) a) Use dynamic programming to find the value of: **[10]**

Max $Z = y_1 . y_2 . y_3$

Subject to the constraints

$y_1 + y_2 + y_3 = 5$ and $y_1, y_2, y_3 \geq 0$

b) Explain the concept of dynamic programming and the relation between dynamic and linear programming. **[6]**

OR

Q12) a) Solve the following LP problem by dynamic programming **[10]**

Maximize $Z = 8x_1 + 7x_2$

Subject to the constraints

i) $2x_1 + x_2 \leq 8$

ii) $5x_1 + 2x_2 \leq 15 \qquad x_1, x_2 \geq 0$

b) Discuss briefly **[6]**

i) The general similarities between dynamic programming and linear programming.

ii) How dynamic programming conceptually differ from linear programming?

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