SEAT No. :

P8462

Oct-22/BE/Insem-34
B.E. (Civil)
Elective III : OPERATIONS RESEARCH
(2019 Pattern) (Semester - VII) (401003F)

Time : 1 Hour]   *[Max. Marks : 30*

Instructions to the candidates :

1) *Attempt Q.1 or Q.2, Q.3 or Q.4.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figure to the right indicates full marks.*
4) *Assume suitable data, if necessary and clearly state.*
5) *Use of cell phone is prohibited in the examination hall.*
6) *Use of electronic pocket calculator is allowed.*

Q1) a) Explain the convex and concave functions with the help of neat sketches. State its applications. **[5]**

b) What are the applications of local and global maximum and minimum values for water supply distribution? **[5]**

c) Formulate following linear problem equation : **[5]**

A company produces two types of motors on separate assembly lines. The respective daily capacities of the two lines are 550 and 700 motors. Type I motor uses 15 units of a certain electronic component, and type II uses only 10 units. The supplier of the component can provide 5000 pieces per day.

The profits per motor for type I and II are Rs 100 and Rs 150 respectively. Optimize the profit.

OR

Q2) a) What should be the value of x if the following functions need to be concave? **[8]**

i) $F(x) = x^3 + x^2$

ii) $F(x) = x^4 + 3x^3 + 6x^2$

iii) $F(x) = x^2 - x^4$

b) An advertising company wishes to reach to maximum number of potential customers through various media after doing market survey as follows:**[7]**

	Facebook	Television	Hoardings
Cost of media	Rs. 3,00,000	Rs. 5,50,000	Rs. 2,00,000
No. of potential customers reached	2,45,000	4,00,000	1,00,000
Number of potential female customers reached	1,00,000	2,75,000	45,000

The companies budget for the total advertisement is Rs, 25,00,000.

Following requirements should be fulfilled after the media publicity :

i) At least 6 lacs exposures should take place among female customers

ii) Advertising on the hoardings is limited to Rs. 12 lacs.

iii) At least 3 hoardings should be booked for advertising

iv) Number of advertising units on television and facebook should be between 4 and 8

Formulate LP model of the problem

Q3) a) There are 5 jobs which have to go through two machines A and B in the order <u>B-A</u>. State the sequence and summarize the idle time for both machines **[7]**

Job	1	2	3	4	5
A	8	10	12	7	9
B	11	10	9	8	9

b) A booking counter has a single window. The arrival rate of the customers is 10 per hour and service rate is 12 per hour. **[8]**

Calculate :

i) Expected number of units in the system

ii) Expected number of units in queue

iii) Average waiting time in the queue

iv) If there are four chairs kept in the reception, state whether these are sufficient.

Q4) a) State the meaning of Kendall's notation as given below : **[4]**

(M/M/1) : (SIRO/N/M)

b) Explain how you apply Monte Carlo simulation technique to queuing problem. **[4]**

c) A company manufactures 100 units every day with the sales demand probability as follows : **[7]**

Sales	97	98	99	100	101	102	103
Proability	0.10	0.12	0.18	0.32	0.16	0.08	0.04

Using following random numbers, simulate the sales for next 10 days and state the number of days when the sale is exactly 100

27, 5, 59, 81, 16, 55, 25, 48, 93, 87

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