CBCS SCHEME

USN | | | | | | | | | |

18ME735

Seventh Semester B.E. Degree Examination, June/July 2024
Operations Research

Time: 3 hrs. Max. Marks: 100

Note:* 1. *Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of area under normal curve is permitted.

Module-1

1 a. Define Operation Research. Mention different phases in OR study. **(06 Marks)**

b. The post master of a local post office wishes to have extra helpers during festival season because of large increase in the volume of mail handling and delivery. Because of limited office space the number of temporary helpers should not exceed 10. According to past experience men can handle 300 letters and 80 packages per day, women can handle 100 letters and 60 packages per day. Post master believes that the delivery volume of extra letters and packages will not be less than 3,400 and 680 respectively. A man receives Rs.25 a day and a woman receives Rs.22 per day. Formulate the above problem as LP model so that total amount paid by post master is minimum. Solve the formulation graphically. **(14 Marks)**

OR

2 a. Differentiate between unbounded and infeasible solution spaces. **(04 Marks)**

b. Solve the LPP graphically:

Maximize $Z = 2x_1 + x_2$

Subjected to constraints $x_1 + x_2 \le 6$

$x_1 + 2x_2 \ge 6$

$x_1 - x_2 \le 2$

$-x_1 + 3x_2 \le 10$ and $x_1, x_2 \ge 0$. **(16 Marks)**

Module-2

3 Solve the LPP by Simplex method:

Maximize $Z = 2x_1 + 10x_2 + x_3$

Subjected to constraints $5x_1 + 2x_2 + x_3 \le 15$

$x_1 + 3x_2 + 2x_3 \le 25$

$2x_1 + x_2 + 7x_3 \le 20$

and $x_1, x_2, x_3 \ge 0$. **(20 Marks)**

OR

4 Solve the LPP by Big-M method:

Maximize $Z = 3x_1 + 2x_2 + 3x_3$

Subjected to constraints $2x_1 + x_2 + x_3 \le 2$

$3x_1 + 4x_2 + 2x_3 \ge 8$

and $x_1, x_2, x_3 \ge 0$. **(20 Marks)**

Module-3

5 a. Differentiate between Balanced and Unbalanced transportation problems with example for each. **(05 Marks)**

b. L and T company needs 3, 3, 4 and 5 million cubic feet of fill at 4 earthen dam sites I, II, III and IV in Karnataka. It can fill from 3 mounds A, B and C where 2, 6 and 7 million cubic feet of fill is available respectively. Costs of transportation for one million cubic feet of fill from 3 mounds to 4 sites in lakhs of rupees are given in following Table.Q5(b). Determine optimal transportation plan which minimizes cost to company.

		Sites			
		I	II	III	IV
Mounds	A	15	10	17	18
	B	16	13	12	13
	C	12	17	20	11

Table.Q5(b) **(15 Marks)**

OR

6 a. Explain maximization in transportation problems. **(04 Marks)**

b. A city corporation has decided to carryout repairs on 4 main arteries of the city. The government has agreed to make a special grant of Rs.50,00,000 towards the cost with the condition that the repair work must be at lowest cost and quickest time. If required, supplementary token grant will also be considered. The corporation has quoted tender and 5 contractors have sent their bids. In order to expedite one road will be awarded to one contractor.

(i) Find the best way to repair the roads and which contractor is unsuccessful in his bid.

(ii) What may be the supplementary grants sought?

	R_1	R_2	R_3	R_4
C_1	9	14	19	15
C_2	7	17	20	19
C_3	9	18	21	18
C_4	10	12	18	19
C_5	10	15	21	16

(16 Marks)

Module-4

7 A project is compose of 7 jobs whose time estimates are given below:

(i) Draw the network and expected duration along critical path.

(ii) Find the probability of completing the project one day earlier and 2 days later.

Activity	1 - 2	1 - 3	1 - 4	2 - 5	3 - 5	4 - 6	5 - 6
t_o	7	16	7	9	20	14	2
t_m	8	18	9	10	24	16	3
t_p	9	20	11	11	28	18	4

(20 Marks)

OR

8 a. Define different types of customer behavior in queue. **(06 Marks)**

b. In a self service store with one cashier, 8 customers arrive on an average of every 5 min and he can serve 10 customers in 5 min. If both arrival and service time are exponentially distributed, then determine:

(i) Average number of customer waiting in the queue for service.

(ii) Expected waiting time in the queue.

(iii) What is the probability of having more than 6 customers in the system? **(14 Marks)**