BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-IV Computer Science & Business Systems : WINTER: 2025
SUBJECT: OPERATION RESEARCH

Day : Wednesday
Date : 03/12/2025

W-29289-2025

Time : 10:00 AM-01:00 PM
Max. Marks : 60

NB :
1. All questions are COMPULSORY.
2. Figures to the right indicate FULL marks for the question.
3. Draw neat labelled diagrams WHEREVER necessary.
4. Assume suitable data, if necessary.

Q. 1 Explain in detail the scientific methodology used in operation research. (10)

OR

Q. 1 State the various types of mathematical models and explain them in detail. (10)

Q. 2 Use Graphical Method to solve the following LP problem (10)

$$Minimize, Z = 20x_1+10x_2$$

Subjected to $x_1+2x_2 \leq 40$

$3x_1+x_2 \geq 30$

$4x_1+3x_2 \geq 60$

$x_1, x_2 \geq 0$

OR

Q. 2 Solve the following linear programming problem using Simplex method (10)

$$Maximize, Z = 30x_1+40x_2+20x_3$$

Subjected to the constraints $10x_1+12x_2+7x_3 \leq 10000$

$7x_1+10x_2+8x_3 \leq 8000$

$x_1+x_2+x_3 \leq 1000$

$x_1, x_2, x_3 \geq 0$

Q. 3 Find the basic feasible solution of the following transportation problem by north-west corner rule. Also find the optimal transportation plan (10)

	1	2	3	4	5	Availability
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Required	60	60	30	40	10	

OR

Q. 3 Find the optimum solution for the following assignment problem (10)

	I	II	III	IV	V
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

Q. 4 Solve the following network analysis using appropriate technique (10)

		Time Durations		
Activity	Predecessor Activity	Optimistic	Most likely	Pessimistic
A	--	5	6	7
B	--	1	3	5
C	--	1	4	7
D	A	1	2	3
E	B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E, F	4	4	10
I	D	2	5	8
J	H, G	2	2	8

Construct the project network, find the expected time durations and variance for each activity. Find the Earliest start time and Latest Completion time. Also find the critical path and expected project durations.

OR

Q. 4 Draw a network to represent the project and find the minimum time of completion of the project when time, in days, of each task is as follows (10)

Task	A	B	C	D	E	F	G	H	I
Time	8	10	8	10	16	17	18	14	9

Also identify the critical path, free float and total float.

Q. 5 A warehouse has to supply 10,000 units of a product per year to his customers. The demand is fixed and known. The shortage cost is assumed to be infinite. The inventory holding cost is Rs. 0.15 per unit per month and the ordering cost per order is Rs.250. Determine the optimal lot size, the optimal scheduling period and the minimum total variable yearly cost. (10)

OR

Q. 5 Explain in detail the inventory model with demand rate uniform and replenishment rate finite. (10)

Q. 6 A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assume Poisson distribution for arrival rate and exponential distribution for service time, find (10)

i. Average number of customers in the system.
ii. Average number of customers in the queue or average queue length
iii. Average time a customer spends in the system.

Average time a customer waits before being served

OR

Q. 6 State the advantages and limitations of simulation process and explain in detail the process of Monte Carlo simulation. (10)

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