Reg. No. : [| | | | | | | | | | |]

Question Paper Code : Z 9343

5 Year M.Sc. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Fifth Semester

Computer Technology

XCS 351 — OPERATIONS RESEARCH

(Common to 5 Year M.Sc., Software Engineering)

(Regulation 2003)

Time : Three hours — Maximum : 100 marks

(Statistical Tables to be permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define objective function and stack variable.

2. Write the dual of the following L.P.P

   Minimize $Z = 4x_1 + 6x_2 + 8x_3$

   Subject to $x_1 + 3x_2 \geq 3$

   $x_1 + 2x_3 \geq 5$ and

   $x_1, x_2, x_3 \geq 0$

3. State the available methods to find the initial basic feasible solution to the transportation problems.

4. What is an assignment model?

5. Distinguish between PERT and CPM.

6. Define Pessimistic time for an activity.

7. Inventory is necessary. Why?

8. Define shortage cost.

9. State the Poisson axioms.

10. What do you mean by M and FCFS in (M/M/1) : (∞ / FCFS) queueing model?

PART B — (5 × 16 = 80 marks)

11. (a) Solve the following LPP by Simplex method (16)

Maximize $Z = x_1 + 4x_2 + 5x_3$

Subject to $3x_1 + 3x_2 \leq 22$

$x_1 + 2x_2 + 3x_3 \leq 14$

$3x_1 + 2x_2 \leq 14$

$x_1, x_2, x_3 \geq 0$

Or

(b) Use Big-M method to solve the LPP (16)

Minimize $Z = 4x_1 + 3x_2$

Subject to $2x_1 + x_2 \geq 10$

$-3x_1 + 2x_2 \leq 6$

$x_1 + x_2 \geq 6$

and $x_1, x_2 \geq 0$

12. (a) Obtain an optimum basic feasible solution to the following transportation problem : (16)

	To			Availability
From	16	19	12	14
	22	13	19	16
	14	28	8	12
Requirement	10	15	17	

Or

(b) (i) What is an unbalanced assignment problem? How is it solved for optimal solution? (6)

(ii) A company has 5 jobs to be done. The following data shows the return (in rupees) by assigning the i th machine to the j th job. Using Hungarian method, assign the 5 jobs to 5 machines so as to maximize the total expected profit. (10)

		Jobs				
		1	2	3	4	5
Machine	A	62	78	50	101	82
	B	71	84	61	73	59
	C	87	92	111	70	81
	D	45	64	87	77	80
	E	60	70	98	66	83

13. (a) The utility data for a network is given below, Determine the total, free and independent floats and identify the critical path (16)

Activity :	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration :	2	8	10	6	3	3	7	5	2	8

Or

(b) A project consists of the following activities and time estimates.

Activity :	1-2	1-3	2-4	3-4	4-5	3-5
Optimistic time :	2	3	5	2	6	8
Most likely time :	5	12	14	5	6	17
Pessimistic time :	14	15	17	8	12	20

(i) Draw the network.

(ii) Calculate the length and variance of the critical path and

(iii) Find the probability that the project will be completed within 30 days. (16)

14. (a) (i) A manufacturer has to supply his customer with 600 units of his product per year. Shortages are not allowed and storage cost amounts to 60 paise per unit per year. The set up cost is Rs. 80. Find EOQ, minimum average yearly cost, the optimum number of order per day and the optimum period of supply per optimum order. (8)

(ii) The probability distribution of monthly sales of an item is as follows :

Sales Unit :	0	1	2	3	4	5	6
Probability	0.01	0.06	0.25	0.30	0.22	0.10	0.06

The cost of carrying inventory (unsold during month) is Rs. 30 per month and cost of unit shortage is Rs. 70. Determine optimum stock to minimize expected cost. (8)

Or

(b) (i) Demand of an item is uniform at a rate of 25 units per month. The fixed cost is Rs. 30 each time a production is made, the production cost is Rs. 2 per unit and the inventory carrying cost is 50 paise per unit per month. If the shortage cost is Rs. 3 per item per month, determine how often to make a production run and of what size? (8)

(ii) An item is produced at the rate of 50 items per day. The demand occurs at the rate of 25 items per day. If the set up cost is Rs. 100 per set up and holding cost is Re.0.01 per unit of item per day, find the economic lot size for one run, assuming that shortages are not permitted. Also find the time of cycle and minimum total cost for one run. (8)

15. (a) (i) Derive the expression $P_n = \left(\frac{\lambda}{\mu}\right)^n \left(1 - \frac{\lambda}{\mu}\right)$ for the queueing model $(M/M/1):(\infty/FCFS)$. (8)

(ii) Customers arrive at a one window bank at the rate of 10 per hour. The average service time is 5 minutes. Find

(1) Average waiting time of a customer in the queue.

(2) Probability that there are 3 persons in the bank.

(3) Probability that the bank has no customers. (8)

Or

(b) (i) Consider a single service queueing system with Poisson input, exponential service times. Suppose the mean arrival rate is 3 calling units per hour, the mean service rate is 4 units per hour and the expected service number of calling units in the system is 2, find the average number of units in the system. (6)

(ii) A Petrol station has two pumps. The service time follows the exponential distribution with mean 4 minutes and cars arrive for service in a Poison process at the rate of 10 cars per hour. Find the probability that a customer has to wait for service. What proportion of time the pump remains idle? (10)