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Question Paper Code : 75547

5 year M.Sc. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fifth/Seventh Semester

Computer Technology

XCS 351/10677 SW 501 — OPERATIONS RESEARCH

(Common to 5 year M.Sc. Information Technology/M.Sc. Software Engineering)

(Regulation 2003/2010)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is degeneracy?

2. Write the dual of the following LPP :

   Maximize $Z = 5x_1 + 8x_2 - 9x_3$

   Subject to :

   $4x_2 + 6x_3 \geq 20$
   $2x_1 + 4x_3 \geq 10$ and
   $x_1, x_2, x_3 \geq 0$.

3. List the different methods to solve a transportation problem.

4. State the difference between transportation and assignment problems.

5. Name any four applications of shortest route problem.

6. What do you mean by critical path?

7. What are the costs associated with inventory control models?

8. What do we mean by reorder level? How do we determine ROL?

9. What are the basic characteristics of queuing phenomenon?

10. Write a note on birth process in queuing theory.

11. (a) Minimize $Z = -3x_1 + x_2 + x_3$

Subject to constraints

$x_1 - 2x_2 + x_3 \leq 11$
$4x_1 + x_2 + 2x_3 \geq 3$
$2x_1 - x_3 = -1$
$x_1, x_2, x_3 \geq 0.$

Or

(b) Solve the LPP using penalty method :

Maximize $Z = 3x_1 - x_2$

Subject to :

$2x_1 + x_2 \geq 2$
$x_1 + 3x_2 \leq 3$
$x_2 \leq 4$ and
$x_1, x_2 \geq 0.$

12. (a) A company has 3 plants X, Y, Z from which it supplies to five markets A, B, C, D, E. Determine the optimal transportation plan from the following data giving the plant to market shipping costs, quantities available at each plant and quantities required at each market.

Plant	A	B	C	D	E	Supply
X	5	8	9	9	3	800
Y	4	7	7	6	5	500
Z	8	4	6	6	4	900
Demand	400	400	500	400	800	

Or

(b) The owner of chain of 4 grocery stores has purchased six crates of fresh strawberry. The estimated probability of potential sales of the strawberry before spoilage differs among the 4 stores. The following table gives estimated total expected profit at each store, when it is allocated various numbers of boxes.

	1	2	3	4
0	0	0	0	0
1	4	2	6	2
2	6	4	8	3
Number of Boxes 3	7	6	8	4
4	7	8	8	4
5	7	9	8	4
6	7	10	8	4

For administrative reasons, the owner does not wish to split crates between stores. However, he is willing to contribute zero crates to any of his stores. Find the allocation of 6 crates to 4 stores as to maximize the expected profit.

13. (a) A small project is composed of 7 activities whose time estimates are as below :

Activity :	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Optimistic time :	1	1	2	1	2	2	3
Most likely time :	1	4	2	1	5	5	6
Pessimistic time :	7	7	8	1	14	8	15

If the project due date is 18 weeks, what is the probability of not meeting the due date?
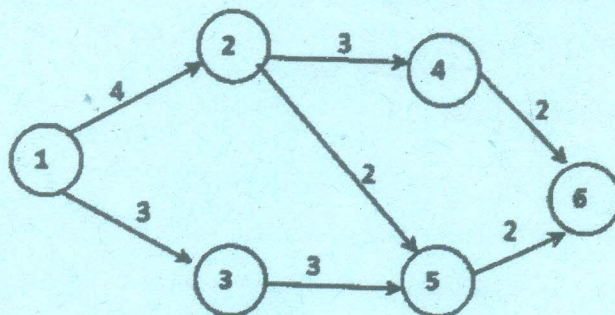
Or

(b) (i) Activity times of a project is shown below :   (8)

Activity : 1-2 1-3 1-4 2-5 2-6 3-6 4-7 5-7

Time :   6   19   28   17   18   8   9   8

Determine critical path.

(ii) Find the shortest path from node 1 to node 6.   (8)

14. (a) (i) Explain the different components of storage cost. (4)

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

Monthly sales :	0	1	2	3	4	5	6
Probability :	0.01	0.06	0.25	0.35	0.20	0.10	0.03

The cost of carrying inventory is Rs. 30 per unit per month and the cost of unit shortage is Rs. 70 per month. Determine the optimal stock level which minimizes the total expected cost. (12)

Or

(b) (i) Determine the EOQ for M/s. XY that has an annual usage of 1000 units of materials whose cost is Rs. 250 per unit. The cost of order is Rs. 6 per order and the expenditure cost is Rs. 4 per order. The inventory holding cost is 20% of avg. inventory. Assume that no shortage allowed. Also find the total annual cost. (6)

(ii) Explain p system of inventory control. (10)

15. (a) Customers arrive at a village post office according to Poisson process with a mean arrival rate of 5 customers per hour. A customer spends an average of 10 minutes in the post office. Assume the service is exponential calculate the following :

(i) Average number of customers in the system

(ii) The waiting time of a customer in the queue

(iii) The percentage of customer who have to wait.

Or

(b) (i) Give some important properties of the Poisson process. (4)

(ii) On average 96 patients per 24 hour require the service of an emergency clinic. Also on average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average servicing time of 10 minutes, and that each minute of decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from $1\ 1/3$ patients to $\frac{1}{2}$ patient? (12)

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