B.E. (IT) Part-II 4th Semester Examination, 2010

Operations Research

(MA-403)

Time : 2 hours **Full Marks : 35**

Answer any FIVE questions.

The questions are of equal value.

1. Solve the Big M method the following L.P.P.

Minimize $Z = 4x_1 + 2x_2$

subject to $3x_1 + x_2 \leq 27$

$x_1 + x_2 \geq 21$

$x_1 + 2x_2 \leq 30$

$x_1, x_2 \leq 0.$

2. Use duality to solve the L.P.P.

Minimize $Z = 3x_1 + 2x_2$

subject to $3x_1 + 2x_2 > 3$

$x_1 + 2x_2 > 1$

$x_1, x_2 > 0.$

3. Solve the L.P.P. using Dual-Simplex method :

Minimize $Z = 6x_1 + 7x_2 + 3x_3 + 5x_4$

subject to $5x_1 + 6x_2 - 3x_3 + 4x_4 > 12$

$x_2 + 5x_3 - 6x_4 > 10$

$2x_1 + 5x_2 + x_3 + x_4 \wedge 8$

$x_1, x_2, x_3, x_4 > 0.$

4. A salesman has to visit 5 cities A, B, C, D, E. The distances (in hundred miles) between the five cities are as follows :

		To A	B	C	D	E
	A	–	7	6	8	4
	B	7	–	8	5	6
•From	C	6	8	–	9	7
	D	8	5	9	–	8
	E	4	6	7	8	–

If the salesman starts from city A and has to come back to city A, which route should be select so that the total distance travelled is minimum.

5. Find the sequence that minimizes the total elapsed required to complete the following tasks :

	A	B	C	D	E	F	G
Machine I	3	8	7	4	9	8	7
Machine II	4	3	2	5	1	4	3
Machine III	6	7	5	11	5	6	12

6. Use dynamic programming to show that $\sum_{i=1}^{n} P_i \log p_i$, subject to $\sum_{i=1}^{n} p_i = I$, is minimum, when $p_1 = p_2 = ... = p_n = \frac{1}{n}$.

7. Consider the following project :

Activity	Time estimate in weeks			Predecessor
	Optimistic time (t_0)	Most likely time (t_m)	Pessimistic time (t_p)	
A	3	6	9	None
B	2	5	8	None
C	2	4	6	A
D	2	3	10	B
E	1	3	11	B
F	4	6	8	C,D
G	1	5	15	E

Find the critical path and standard deviation. Also find the probability of completing the project by 18 weeks. [Given Φ (1.4456) = .4265]

8. The demand rate for an item in a company is D units per month. The company can produce at the rate of P units per month. The set-up cost is Rs. C_3 per order and the holding cost is Rs-Cj per unit, per month.

Write the differential equation of an inventory level q(t) at any time t. Without using calculus, calculate :

(i) Optimum manufacturing quantity,

(ii) The maximum inventory level,

(iii) Time between orders,

(iv) The time of manufacture,

(v) The optimum total average cost.

9. Find the optimum order quantity for a product, the price breaks for which are as follows :

Order quantity	Unit price
$0 < q, < 100$	Rs.20 per unit
$100 < q_2 < 200$	Rs. 18 per unit
$200 < q_3$	Rs. 16 per unit

The monthly demand for the product is 400 units. The storage cost is 20% of the unit cost of the product and the cost of ordering is Rs.25.