

B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2011

MANUFACTURING ENGINEERING BRANCH

SIXTH SEMESTER

**ME512 OPERATIONS RESEARCH**

(REGULATIONS 2004)

Durations: 3hr

Max Mark: 100

Answer ALL QuestionsPart - A (10 X 2 = 20Marks)

1. Define slack variables.
2. What is the purpose of sensitivity analysis?
3. What are the benefits of knowing the shortest path in a network?
4. List the major assumptions made while dealing with sequencing problems.
5. Define reorder level.
6. Distinguish between deterministic and stochastic models.
7. List and explain any 4 queuing policies.
8. What is Kendall's notation?
9. What is meant by payoff matrix?
10. State the main purpose of replacement analysis.

Part - B (5 X 16 = 80Marks)

11. Construct the network for the project whose activities and the three time estimates of these activities (in weeks) are given as below. Compute the expected duration, expected variance of each activity and expected variance of the project length.

Activities	1-2	2-3	2-4	3-5	4-5	4-6	5-7	6-7	7-8	7-9	8-10	9-10
$t_o$	3	1	2	3	1	3	4	6	2	1	4	3
$t_m$	4	2	3	4	3	5	5	7	4	2	6	5
$t_p$	5	3	4	5	5	7	6	8	6	3	8	7

(16)

12. i. Solve the LPP:

$$\begin{aligned} & \text{Maximise } Z = 2x_1 + x_2 \\ & \text{subject to. } 4x_1 + 3x_2 \leq 12 \\ & \quad \quad \quad 4x_1 + x_2 \leq 8 \end{aligned}$$

$$4x_1 - x_2 \leq 8$$

$$\text{and } x_1, x_2 \geq 0. \quad (12)$$

ii. Write the dual of the given LPP.

subject to.

$$\text{Maximise } Z = 4x_1 + 2x_2$$

$$-x_1 - x_2 \leq -3$$

$$x_1 - x_2 \geq 2$$

$$\text{and } x_1, x_2 \geq 0. \quad (4)$$

(OR)

b. Solve the following transportation problem to minimise the total cost of transportation.

	1	2	3	4	Supply
Origin 1	14	56	48	27	70
Origin 2	82	35	21	81	47
Origin 3	99	31	71	63	93
Demand	70	35	45	60	210

(16)

13.a.i. A particular type of fabric item manufactured by a company has a demand of 14,000 units/year. The company can produce 2200 such items per month. The cost of one setup is Rs.450 and the holding cost/unit/month is Re.0.23. Find the optimum lot size, maximum inventory, manufacturing time and total time. (12)

ii. Write detailed notes on buffer stock. (4)

(OR)

b. Find the optimal order quantity for which the price breaks are as follows:

Quantity	Unit cost
$0 \leq q_1 \leq 750$	Rs. 50
$750 \leq q_2 \leq 1500$	Rs. 45.75
$1500 \leq q_3$	Rs. 40.25

The monthly demand for the product is Rs.350 units, shortage cost is 2% of the unit cost and the cost of ordering is Rs.150. (16)

14.a. Customers arrive at a photocopying shop based on Poisson distribution at the rate of 12 per hour. The time taken for service is distributed exponentially with a mean of 4 minutes. Find the average number of customers in the shop, average waiting time of the customers, average queue length and the probability that there are 3 customers in the shop. (16)

(OR)

b. A medical camp operating with two doctors has service time exponentially distributed with a mean of 4 minutes and patients arrive for treatment in a poisson process at the rate of 10 per hour. Find the probability that a customer has to wait for service, What proportion of the time the doctor remains idle? (16)

15.a.Reduce the following game by dominance and find the game value.

	I	II	III	IV
I	3	2	4	0
II	3	4	2	4
III	4	2	4	0
IV	0	4	0	8

(16)

(OR)

b. Write detailed notes on multivariable search technique.

(16)