

**III B.Tech II Semester Supplementary Examinations, April/May 2005**  
**OPERATIONS RESEARCH**  
**(Computer Science & Systems Engineering)**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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- What is a model? Briefly explain about iconic and analogue models.
  - Use Big-M method to Minimize  $Z=12X_1+20X_2$   
Subject to the constraints  
 $6X_1+8X_2 \geq 100$   
 $7X_1+12X_2 \geq 120$  and  
 $X_1, X_2 \geq 0$
- Give the mathematical representation of a transportation problem.
  - For the following transportation problem find the solution for maximum profit

Ware House

|         |    | W1 | W2  | W3  | W4  | Supply |
|---------|----|----|-----|-----|-----|--------|
| Factory | F1 | 90 | 90  | 100 | 110 | 200    |
|         | F2 | 50 | 70  | 130 | 85  | 100    |
| Demand  |    | 75 | 100 | 100 | 30  |        |

The cell values are profit per unit.

- Solve the following sequence problem to minimize the total time elapsed such that the operation sequence  $M_1M_2$

| Job           | 1  | 2 | 3 | 4 |
|---------------|----|---|---|---|
| Machine $M_1$ | 10 | 8 | 5 | 6 |
| Machine $M_2$ | 3  | 2 | 8 | 7 |

Also find the total elapsed time and idle times of each machine

- The following mortality has been observed for a certain type of ICs used in a digital computer :

| Week                               | 1  | 2  | 3  | 4  | 5   |
|------------------------------------|----|----|----|----|-----|
| Percent failing by the end of week | 10 | 25 | 50 | 80 | 100 |

Group replacement of ICs costs Rs.0.30 per transistor, where as individual replacement costs Rs.1.25. What is the best interval between group replacements? At what group replacement price per transistor would a policy of strictly individual replacement become preferable to the adopted policy

- Briefly explain the importance of game theory
  - Two oil companies, Indian oil co. and caltex are trying to increase their market at the expense of the other Indian oil co, is considering possibilities of decreasing the prices, giving free soft drinks on Rs.100 purchase of oil or

giving away a free gift with each 40 litre purchase. Obviously caltex cannot ignore this and comes out with its own programme to increase its share in the market.

|                |                                     | Caltex         |                                     |                              |
|----------------|-------------------------------------|----------------|-------------------------------------|------------------------------|
| Indian oil Co. |                                     | Decrease price | Free Soft Drinks on Rs 100 purchase | Free gifts on 40 its or more |
|                | Decrease price                      | 4%             | 1%                                  | -3%                          |
|                | Free soft drinks on Rs 100 purchase | 3              | 1                                   | 6                            |
|                | Free gifts on 40 its or more        | -3             | 4                                   | -2                           |

Determine the optimal strategies for the two oil companies.

6. For the case of two channels, Poisson arrivals and exponential services, show the following:

(a) Probability that birth channels are empty is  $\frac{(2\mu-\lambda)}{(2\mu+\lambda)}$

(b) Expected number in the system is  $\frac{(4\mu\lambda)}{(4\mu^2-\lambda^2)}$

7. (a) Write a note on periodic review inventory system and Fixed order quantity system
- (b) A company consumes 200 items/month working 30 days in a month. The cost of the item is Rs.1000. For a lot of more than 50, the price is Rs.950. Find out the optimum purchase quantity if ordering cost is Rs.10,000 and handling charges are 1% of unit cost per month. If the discounted price is available for a lot of more than 75 items, find the optimum purchase quantity.

8. Use Dynamic programming to solve

$$\text{Minimize } Z = y_1^2 + y_2^2 + y_3^2$$

$$\text{Subjected to } y_1 + y_2 + y_3 = 5; \quad y_1, y_2, y_3 \geq 0$$

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