

Code :R7321502

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III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
MATHEMATICAL MODELING & SIMULATION
 (Computer Science & Systems Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
 All questions carry equal marks
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1. (a) What is a model? Discuss various classification schemes of models.
 (b) Find all basic solutions for the problem.
 Maximize $Z = x_1 + 2x_2$
 Subject to constraints $x_1 + x_2 \leq 10$
 $2x_1 - x_2 \leq 40$ and
 $x_1, x_2 \geq 0$
 2. (a) Distinguish between pure and mixed integer programming problem.
 (b) Find the optimal integer solutions to the following LPP.
 Maximize $Z = x_1 + 4x_2$
 Subject to the constraints $2x_1 + 4x_2 \leq 7$
 $5x_1 + 3x_2 \leq 15$
 $x_1, x_2 \geq 0$
 And are integers.
 3. (a) Explain the different types of Inventory models in brief.
 (b) Describe about classic EOQ model and explain its characteristics.
 4. (a) Explain ABC analysis. What are its advantages and disadvantages?
 (b) What is selective inventory control? From the following details, Draw a plan of ABC selective control.
- | Item | Units | Unit Cost |
|------|--------|-----------|
| 1 | 7,000 | 5.00 |
| 2 | 24,000 | 3.00 |
| 3 | 1,500 | 10.00 |
| 4 | 600 | 22.00 |
| 5 | 38,000 | 1.50 |
| 6 | 40,000 | 0.50 |
| 7 | 60,000 | 0.20 |
| 8 | 3,000 | 3.50 |
| 9 | 300 | 8.00 |
| 10 | 29,000 | 0.40 |
| 11 | 11,500 | 7.10 |
| 12 | 4,100 | 6.20 |
5. (a) Define queue. Explain basic structure of queuing model.
 (b) What are different assumptions of the birth and death process? Explain the analysis of the birth-and-death process.
 6. (a) Explain in brief about construction of time scheduling with suitable example.
 (b) Describe briefly about PERT and CPM with an example.
 7. What do you mean by random numbers? What are different methods of generating random numbers?
 8. (a) Discuss the steps in the development of a useful model of input data.
 (b) Explain statistical model for estimation the effect of design alternatives.

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1. (a) What is simplex? Write the steps used in simplex method.
 (b) Solve the following L.P problem by simplex method
 Maximize $Z = 4x_1 + 10x_2$
 Subject to the constraints: $2x_1 + x_2 \leq 50$
 $2x_1 + 5x_2 \leq 100$
 $2x_1 + 3x_2 \leq 90$
 $x_1 \geq 0 \& x_2 \geq 0$
2. Write a short notes on the three methods used for finding an initial basic feasible solution for a transportation problem.
3. (a) Differentiate between No-setup model and set-up model in dynamic EOQ models. With an a example.
 (b) Derive the EOQ formula for the manufacturing model with shortage.
4. Describe various selective inventory management techniques. Explain how these techniques can be combined to develop broad policy guidelines for selective control.
5. (a) List some of the applications of queuing theory.
 (b) Explain about Jackson networks with an example.
6. (a) How PERT calculations differ from CPM based on three estimates.
 (b) Explain the main objectives of critical path analysis and define the following terms.
 - i. Forward pass calculation.
 - ii. Backward pass calculation.
 - iii. Critical path.
7. (a) Use the linear congruential method to generate a sequence of three two digit random integers.
 Let $X_0=27$, $a=8$, $c=47$ and $m=100$
 (b) Explain Inverse Transformation techniques in detail.
8. (a) What is the importance of histograms in input modeling? How do you construct a histogram?
 (b) What are the types of simulation with respect to output analysis?

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- What is the difference between dual and primal problems?
 - Obtain the dual of the L.P.P
Maximize $Z = 2x_1 + 3x_2 + 4x_3$
Subject to constraints: $2x_1 + 3x_2 + 5x_3 \geq 2$
 $3x_1 + x_2 + 7x_3 = 3$
 $x_1 + 4x_2 + 6x_3 \leq 5$
 $x_1, x_2 \geq 0$ & x_3 is Unrestricted.
- Write the difference between transportation and assignment problems.
 - Solve the following assignment problem to find the maximum total expected sale.

Area	I	II	III	IV
Salesman A	42	35	28	21
B	30	25	20	15
C	30	25	20	15
D	24	20	16	12

- What are the different continuous review models and explain.
 - Describe about multi-item EOQ model with storage limitation.
- What is ABC analysis? Why it is necessary?
 - The following thirty numbers represent the annual value in thousands of rupees of same thirty items of materials selected at random. Carry out an ABC analysis and list out the values of 'A' item only.

1	2	4	9	75	4	25
3	6	13	2	4	12	30
100	2	7	40	15	55	1
11	15	8	19	1	20	1
3	5					

- Write short notes on:
 - Birth and death process.
 - Queue discipline.
 - Capacity of the system.
 - Balking and Jockeying.
- Discuss in brief about float of an activity and event.

- (b) A small project consists of seven activities for which the relevant data are given below:

Activity	Preceding Activities	Activity Duration
A	-	4
B	-	7
C	-	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

- (i) Draw the network and find the project completion time.
(ii) Calculate total float for each of the activities.
(iii) Draw the time scaled diagram.

7. (a) Explain the concept in discrete-event simulation with example.
(b) Explain the direct transformation for the normal distribution.
8. (a) What parameters do you consider to compare two system designs, illustrate it with example.
(b) Distinguish model verifications and validation.

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1. (a) Write a short notes an nature & scope of operation research.

- (b) Solve the following L.P problem by graphical method.

$$\begin{aligned} \text{Maximize } Z &= 20x_1 + 40x_2 \\ \text{Subject to constraints } 36x_1 + 6x_2 &\geq 108 \\ 3x_1 + 12x_2 &\geq 36 \\ 20x_1 + 10x_2 &\geq 100 \\ \text{and } x_1, x_2 &\geq 0 \end{aligned}$$

2. (a) What are the Kuhn-Tucker condition for the optimal solution of general NLPP.

- (b) Use Kuhn-Tucker condition to follow the NLPP

$$\begin{aligned} \text{Maximize } Z &= 8x_1 + 10x_2 - x^2 - x^2 \\ \text{Subject to constraints } 3x_1 + 2x_2 &\leq 6, x_1 \geq 0, x_2 \geq 0 \end{aligned}$$

3. (a) Explain about EOQ price breaks.

- (b) Fine the optimum order quantify for a product for which the price breaks are as follows:

Quantity	Unit cost (Rs)
$0 \leq Y_1 < 500$	10.00
$500 \leq Y_2$	9.25

The monthly demand for the product is 200 Units, The cost of storage is 2 % of the unit cost and the cost of ordering is Rs 350.00

4. What is the use of ABC, XED and other classification to departments other than inventory control? What is the use of purchasing, for maintenance, for quality control?

5. Explain six key properties of exponential distribution.

6. (a) Define the terms:

- (i) Event float.
 (ii) Total float.
 (iii) Free float.
 (iv) Independent float.

- (b) The following table gives the activities in construction project and time duration:

Activity	Preceding Activity	Normal time (Days)
1-2	-	20
1-3	-	25
2-3	1-2	10
2-4	1-2	12
3-4	1-3, 2-3	5
4-5	2-4, 3-4	10

- (i) Draw the activity network of the project.
 (ii) Find the total and free-float for each for each activity.
 (iii) Determine the critical path and the project duration.

7. (a) What is a system? Name several entities. Attributes, activities events and state-variables for the following systems:

- (i) Super Market (ii) Traffic system.

- (b) List and discuss various periods in the history of simulation software.

8. Explain the process of calibration and validation of simulation models.
