Punjab Technical University
Master of Computer Application Examination

MCA 3rd Semester OPTIMIZATION TECHNIQUES 2006

Time: Three hours maximum: 100marks

PART A Answer all questions (8x5=40 marks)

1. (a) Explain how will you formulate a mathematical model to a given linear programming problem. Or (b) Use graphical method to solve the following Max z=3x1 +4X2 Subject to 5X1 + 4X2 <= 200 3x1 + 5X2 <=150 5x1 + 4X2 >= 100 SX1 + 4X2>=8O X1X2 >=O.

2. (a) Explain the different categories of stochastic processes with simple examples. Or (b) explain the recurrent class of Markov chain and state the criteria for recurrence.

3. (a) Explain the main characteristics of the Queuing system. Or (b) establish the probability distribution formula for pure-death process.

4. (a) What is queuing theory? Explain the basic elements of queues. Or (b) At a public telephone booth in a post office arrivals are considered to Poisson with an average inter-arrival time of 12 minutes. The length of the phone. Call may be assumed to be distributed exponentially with an average of 4 minutes. Calculate the following: (I) What is the probability that a fresh arrival will not have to wait for phone? (ii) What is the probability that an arrival will have to wait more than 10 minutes before the phone is free?

5. (a) Give a brief outline of the revised simplex method. Or (b) Write down the dual of the following LPP Min z = 4x1 + 3X2 -2x3 Subject to 3X1 + 6X2 + 4x3 >=6 7 X1 + X2 + 2x3 >= 5. 6x1 - 2X2 – X3<= 9 2x1 - X2 + 3x3 >= 4 4x1 + 6X2 – X3 >= 2 X1, X2, X3>=0.

6. (a) Explain some of the practical applications of Integer programming problem. Or (b) Explain how the assignment problem can be treated as a particular case of transportation problem.

7. (a) What are the unbalanced assignment problem? How are they solved? Or(b) Explain the nature of a travelling salesman problem and give its mathematical formulation.

8. (a) Explain the mechanism of queuing process by considering some illustration.Or (b) A customer owning a Maruti car right now has got the option to switch over to Maruti, Ambassador or Fiat next time with the probability (0.20, 0.5 and 0.30) given the transition matrix.
0040 0.30 0.30 P = 0.20 10.50 0.30 0.25 0.25 0.50 Find the probabilities with his fourth purchase?

PART B Answer ALL questions. (5 x 12 = 60 marks)

9. (a) Solve the following LPP using simplex method Maximize z =3X1 + 5X2 + 4X3 . Subject to 2X1 +3X2<=8 2X2 + 5x3 <=10 3x1 + 2X2 + 4X3 <=15 and Xl. X2 X3 >= 0 Or (b) Use revised simplex method to solve the LPP. Minimize z= -4x1 + X2 + 2X3Subject to 2x1 - 3X2 + 2X3 <=12 -5x1 + 2X2+3X3 >=4 3x1-2x3=-1 and X1, X2, X3 >=0.

10. (a) Use penalty method to solve the following LPP. Minimize Z=4X1+X2 Subject to3X1+X2=3 4X1 + 3X2 >= 6 x1 + 2X2 <=3 and X1,X2 >=0.Or (b) Solve by the dual simplex method the following LPP Minimize z = 5x1 + 6X2Subject to X +X2 2:24xj + X2 2: 4 X2 2:0. (b) A fair die is tossed repeatedly. If Xn denotes the maximum of the numbers occurring in the first n tosses, find the transition probability matrix p of the Markov chain {XnJ. Find also p2 and P(X2 = 6).

11. (a) A supermarket has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes and if the people arrive in a Poisson fashion at the rate of 10 per hour (i) What is the probability of having to wait for service?(ii) What is the expected percentage of idle time for each girl?(iii) If a customer has to wait, what is the expected length of his waiting time. Or (b) Discus the fields of application for queuing. Explain queue discipline and its various form.

12. (a) A travelling salesman has to visit 5 cities. He wishes to start from a particular city visit each city once and then return to his starting point cost of going from one city to another is shown below. You are required to find the least cost route. To city
A B C D E
A 00 4 10 14 2
B 12 00 6 10 4
From City C 16 14 00 8 14
D 24 8 12 00 10
E 2 6 4 16 00
Or (b) Find the optimum integer solution to the following linear programming problem Maximize Z =XI + 2X2 Subject to 2X257 xI + X2 572x] 51 and xI' X2 2: 0 and are integers.

13. (a) Define the Markov -'property for a discrete space continuous time process. Prove that a process having independent and stationary increments is Markov