GIET MAIN CAMPUS AUTONOMOUS,
GUNUPUR - 765022

Registration No: | | | | | | | | | | | **M.TECH**

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M.TECH 3rd SEMESTER REGULAR EXAMINATIONS, DECEMBER 2018
OPTIMIZATION ALGORITHMS
Branch: PE, Subject Code:MPE0E3011
(Regulations 2017)

Time: 3 Hours **Max Marks : 70** **Question Code: RD18002002**

PART-A (10 X 2=20 Marks)

1. Answer the following questions.

a. Define Basic feasible solution and optimal solution of a LPP.

b. Give a mathematical formulation to the following LPP:

A retailer deals in two items only, item A and item B. he has Rs. 50000 to invest and a space to store at the most 60 pieces. An item of A costs him Rs. 2500 and B costs him Rs. 500. Net profit to him on item A is Rs. 500 and on item B is Rs. 150. If he can sell all the items that he purchases, how much should he invest him amount to have maximum profit.

c. What roles do slack and surplus variables play in linear programming problem?

d. When does a LPP show that the solution is unbounded?

e. Why do we need artificial variable? What is the cost co-efficient of artificial variable for maximization LPP in Big-M or penalty method?

f. State one disadvantage of using North-west corner rule to find the initial solution to the transportation problem.

g. What is shadow price, explain?

h. What is canonical form? Example?

i. What is the basic concept of Golden search method?

j. When Kuhn-Tucker conditions are sufficient for maximization of a nonlinear function f(x)?

PART-B (5 X 10=50 Marks)

Answer any five questions from the following.

2.a). The postmaster of a local post office wishes to hire extra helpers during the Deepawali season, because of a large increase in the volume of mail handling and delivery. Because of the limited office space and the budgetary condition, the number of temporary helpers must not exceed 10.According to the past experience, men can handle 300 letters and 80 packages per day, on the average, and women can handle 400 letters and 50 packages per day. The post master believes that the daily volume of extra mail and packages will be no less than 3400 and 680 respectively. A man receives Rs.250 a day and a woman receives Rs.220 a day. How many men and women helpers should be hired to keep the pay roll at a minimum? [5]

Formulate the above problem into an LPP and solve graphically.

b) A manufactures two types of product A&B.Each A is expected to give profit of Rs.40 whileeach B may give a profit of Rs.70. Both these have to be manufactured by three machines say M1,M2 and M3 ,whose maximum available hours per week are 48,50 and 60 hours respectively. Each A requires 4,2 and 5 hours each B requires 4,5 and 3 hours on M1 ,M2 and M3 respectively. Determine the product mix so as to maximise the total net contribution. [5]

3. a) A manufacturer of leather belts makes three types of belts a, b, c, which are processed on three machines m1, m2 and m3. Belt **a** requires 2hrs on machine m1, 3hrs on m2 and 2hrs on m3. Belt **b** requires 3hrs on machine m1, 2hrs on m2 and 2hrs on m3. Belt **c** requires 5hrs on m2 and 4hrs on m3. There are 8hrs of time per day available on m1, 10hrs on m2 and 15hrs on m3. The profit gained from belt a, b, c is Rs. 3.00, Rs. 5.00 and Rs. 4.00 respectively. Formulate the linear programming problem and solve it by simplex method. [5]

b) Solve using Big-M method [5]

Min z=12x+20y

STC. $6x+8y \geq 100$

$7x+12y \geq 120$

4. a) Solve the following lpp by simplex method. [5]

Minimize $Z = 5X_1 + 3X_2$

Subject to $2X_1 + 4X_2 \leq 12$

$2X_1 + 2X_2 \leq 10$

$5X_1 + 2X_2 \leq 10$

and $X_1, X_2 \geq 0$

b) a. Assign the jobs to machines to minimise the cost [5]

Job				
Machines	**J1**	**J2**	**J3**	**J4**
M1	**5**	**7**	**11**	**6**
M2	**8**	**5**	**9**	**6**
M3	**4**	**7**	**10**	**7**
M4	**10**	**4**	**8**	**3**

5. a) In a public telephone booth, the arrivals on an average are 10 per hour. A callon an average takes 5 minutes. If there is just one phone, find the expected number of callers in the booth at any time and the proportion of the time, the booth is expected to be idle? [5]

b) Solve the following lpp by simplex method. [5]

Minimize $Z = 5X_1 + 3X_2$

Subject to $2X_1 + 4X_2 \leq 12$

$2X_1 + 2X_2 \leq 10$

$5X_1 + 2X_2 \leq 10$

and $X_1, X_2 \geq 0$

6. a) Verify whether it is convex or concave or neither. [5]

(i) $f(x)=6-x^2$

(ii) $f(x)=x^4+2x^2-2x$

b) Maximise $z = 2x_1 + 3x_2$ subject to conditions $6x_1 + 5x_2 \leq 25$, [5]

$x_1 + 3x_2 \leq 10$

$x_1 , x_2 \geq 0$ and are integers

7. a) Arrival rate of telephone calls at a telephone booth is according to Poisson distribution with an average of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be an exponentially distributed with mean 3 minutes. [5]

i) Determine the probability that a person arriving at a booth will have to wait.

ii) Find the average queue length that is formed from time to time.

iii) Average queue length

b) For the above numerical find i) Find the fraction of the day that the phone is in use [5]

ii) Find the probability that only 2 persons are there in the queue

8.Answer all

a) Barrie algorithm. [5]

b) GRG method [5]

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