M.Sc. 4th Semester Examination, 2020

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

PAPER— MTM-405 (Unit-II : OR)

(Practical)

*Full Marks :*25   *Time:*2 Hours

Answer any *one* question.

1. Write a program in LINGO and MATLAB to solve the following LPP using Simplex Method.

$$\text{Max } Z = 4x_1 + x_2$$
$$\text{s.t,} \quad x_1 + 2x_2 \leq 3$$
$$3x_1 + x_2 \geq 3$$
$$4x_1 + 3x_2 = 6 \quad x_1, x_2 \geq 0$$

2. Write a program in MATLAB and LINGO to solve the following LPP using Revised simplex method

$$\text{Max } Z = 4x_1 + 7x_2$$
$$\text{Subjest to,} \quad 12x_1 + 7x_2 \leq 42$$
$$5x_1 + 4x_2 \leq 20$$
$$2x_1 + 3x_2 \geq 6$$
$$x_1, x_2 \geq 0$$

3. Write a programme in LINGO and MATLAB to solve the following QPP using Wolf's method.

$$\text{Max } z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$$
$$\text{Subject to,} \quad x_1 + 2x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

4. Write a program in LINGO and MATLAB to solve the following integer programming problem uging Gomory's Cutting plane method.

$$\text{Min } 8x_1 + x_2$$
$$\text{subject to,} \quad x_1 + 2x_2 \geq -14$$
$$-4x_1 - x_2 \leq -33$$
$$2x_1 + x_2 \leq 20, \quad x_2 \text{ is an integer.}$$

5. Write a program in LINGO & MATLAB to solve the following Problem using Dynamic Programming technique.

$$\text{Max } Z = y_1^2 + y_2^2 + y_3^2$$
$$\text{s.t,} \quad y_1 y_2 y_3 \leq 4$$

where $y_1 y_2 y_3$ are positive integers.

6 Write a program in LINGO and MATLAB solve the following Geometric Programming problem.

$$\text{Minimize } f(x) = 5x_1 x_2^{-1} x_3^2 + x_1^{-2} x_2^{-1} + 10x_2^2 + 2x_1^{-1} x_2 x_3^{-2}$$

7 Write a program in LINGO & MATLAB to solve find the Nash equilibrium strategy and Nash equilibrium outcome of the following bi-matrix game.

$$A = \begin{bmatrix} 1 & 0 \\ 2 & -1 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix}$$

8 Write a program in LINGO & MATLAB to solve the following Queuing problem.

In a car wash service facility information gathered indicates that cars arrive for service according to a Poisson distribution with mean 5 per hour.The time for washing and cleaning for each car varies but is found to follow an exponential distribution with mean 10 minutes per car .The facility cannot handle more then on ecar at a time and has a total of 5 perking spaces.If the parking spot is full newly arriving cars balk to 6 services elsewhere.

(a)How many customers the managers of the facility is loosing due to the limited parking spacaces?

(b)What is expected waiting time until a car is washed?

9 Write a program in LINGO & MATLAB to solve thefollowing problrm of inventory.

A factory Consumes 5000 units of a Component per year .The orderin ,receiving and handling Cost are Rs.3.00 per order while trucking cost is Rs.1200 per order, interest cost Rs.0.06 per unit per year ,Deterioration and obsolance cost Rs.0.004 per year and storage cost Rs. 1000 per year for 5000 units.Calculate the economic order quantity and minimum average cost.

10 Write a program in LINGO & MATLAB to solve the following Stochastic Programming Problem.

A manufacturing farm produces two machines parts using laths ,milling machines and grinding machines.The machining times available per week on different machines and the machining times required on different machines for each part are given below. Assuming that the profit per unit of eacg of the machines parts I and II is a normally disturbed random variables ,find the number of machine parts to be manufacturing per week to maximizing the profit.The mean value and standared deviation of profit are Rs.50 and 20 per unit for part I and Rs.100 and 50 per unit for part II.

Type of Machine	Machine time required per piece(minutes)		Maximum time available per week(minutes)
	Part I	Part II	

Lathes	$a_{11} = 10$	$a_{12} = 5$	$b_1 = 2500$
Milling Machines	$a_{21} = 4$	$a_{22} = 10$	$b_2 = 2000$
Grinding Machines	$a_{31} = 1$	$a_{32} = 1.5$	$b_2 = 450$

11   Write a script in MATLAB & LINGO to solve the following LPP using Revised Simplex Method.

Max z = $x_1 + x_2$
   Subject to,
$3x_1 + 2x_2 \leq 6$
$x_1 + 4x_2 \leq 4$
$x_1, x_2 \geq 0$

12   Write a program in LINGO & MATLAB to solve thefollowing LPP using Simpelx method.

Max Z= $x_1 + x_2$
   Subject to, $x_1 + 2x_2 \leq 2000$
      $x_1 + x_2 \leq 1500$
$x_2 \leq 600$
$x_1, x_2 \geq 0$

13 Write a program in LINGO & MATLAB to solve the following QPP using Woife,s modified simplex methoed.

$Max z = 4x_1 + 6x_2 - 2x_1^2 x_2 - 2x_2^2$
$Subject to, x_1 + 2x_2 \geq 0$

14 Write a program in LINGO & MATLAB to solve the following Integer Programming Problem using Gomory,s cutting plane method.

Max z = $x_1 + 2x_2$
      Subject to, $2x_2 \leq 7$
$x_1 + x_2 \leq 7$
$2x_1 \leq 11$
$x_1, x_2 \geq 0$ and are integers.

15   Write a program in LINGO to solve the following Dynamic Programming technique.

Mni Z=$y_1^2 + y_2^2 + y_3^2$
subject to, $y_1 + y_2 + y_3 \leq 5$
   $y_1, y_2, y_3 \leq 0$

16 Write a program in LINGO & MATLAB to solve the following inventory problem using Geometric Programming Problem.

Minimize f(x)=$7x_1 x_2^{-1} + 7x_2 x_3^{-2} + 5x_1^{-3} x_2 x_3 + x_1 x_2 x_3$

17 Write a program in LINGO & MATLAB to find the Nash equilibrium strategy and Nash equilibrium outcome of the following bi-matrix game

18 Write a MATLAB program to solve the following Qneuing problem.
Arrivals at a telephone booth are considered to be poisson with an average time of 10 minutes between one arrival and the next .The length of a phone call is assumed to be distributed exponentially with mean 3 minutes.
(a)What is the probability that a person arriving at the both will have to wait?
(b)What is the average length of ququqs that form from time to time.
(c)The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least 3 minutes for the phone.By how much must the flow of arrivals be increased to justify a second booth/
(d)Find the average number of units in the system.
(e)What is the probability that an arrival has to wait more than 10 minuts beforw the phone is free?
(f)Estimate the protection of a day that the phone will be in use(busy).

19   Write a program in LINGO & MATLAB to solve the following problem of Inventory.

   An engineering factory consumes 5000 units of a component per year .The ordering ,receiving and handling cost are Rs.300 per order while trucking cost is Rs.1200 per order,internet cost Rs.0.06 per unit per year,Deterioration and obsolence cost Rs.0.004 per year and storage cost Rs.1000 per year for 5000 units .Calculate the economic order quantity and minimum average cost.

20   A small project is composed of Seven activities,whose time estimates are listed below:

Estimated duration(weeks)

Activity	Optimistic	Mostlikely	Pessimistic
1 – 2	1	1	7
1 - 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	2	5	14
4 - 6	2	5	8
5 – 6	3	6	15

Write the MATLAB program to find the criticakalpath of the above network.

FIELD WORK : 05