A.D.M.COLLEGE FOR WOMEN, NAGAPATTINAM

(AUTONOMOUS)

BCA Degree Examination

III Semester – November – 2022

AC IV – MATHEMATICS III

Time: 3 hours   **Maximum Marks: 75**

Section –A   **10X2=20**

Answer **ALL** the Questions:

1. What is meant by Linear Programming Problem?

2. Define Slack variable.

3. Define Basic feasible solution of LPP.

4. What are the two methods for solving linear programming problem with artificial variables?

5. Define Degenerate basic feasible solution.

6. When an Assignment problem is said to be unbalanced?

7. What is meant by Sequencing problem?

8. Define Idle time in sequencing problem.

9. What is a network?

10. Define Critical path.

Section –B   **5X5=25**

Answer **ALL** the Questions:

11. a) Old hens can be bought for Rs.2.00 each but young ones cost Rs.5.00 each. The old hens lay 3 eggs per week and the young ones, 5 eggs per week, each being worth 30 paise. A hen costs Re.1.00 per week to feed. If I have

(1)

only Rs.80.00 to spend for hens, how many of each kind should I buy to give a profit of more than Rs.6.00 per week, assuming that I cannot house more than 20 hens? Write a mathematical model of the problem.

(or)

b) Rewrite in standard form the following linear programming problem:

$$Minimize\ z = 2x_1 + x_2 + 4x_3$$

subject to the constraints : $-2x_1 + 4x_2 \leq 4$

$$x_1 + 2x_2 + x_3 \geq 5$$

$$2x_1 + 3x_3 \leq 2$$

$x_1, x_2 \geq 0\ and\ x_3\ unrestricted\ in\ sign.$

12. a) Use two-phase simplex method to $Maximixe\ z = 5x_1 + 3x_2$
   subject to the constraints: $2x_1 + x_2 \leq 1,\quad x_1 + 4x_2 \geq 6\ and\ x_1, x_2 \geq 0$

(or)

b) Write the iterative procedure to solve a linear programming problem using the method of penalty.

13. a) Find the initial basic feasible solution for the following Transportation problem using North-West corner rule.

	D_1	D_2	D_3	D_4	Supply
O_1	5	3	6	2	19
O_2	4	7	9	1	37
O_3	3	4	7	5	34
Demand	16	18	31	25	

(or)

(2)

b) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows:

	Job	1	2	3	4	5
	A	8	4	2	6	1
	B	0	9	5	5	4
Person	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

Determine the optimum assignment schedule.

14. a) Write down the procedure for determining the optimal sequence for n jobs on 2 machines.

(or)

b) Use graphical method to minimize the time added to process the following jobs on the machines shown, i.e., for each machine find the job which should be done first. Also calculate the total time elapsed to complete both the jobs:

Job 1   Sequence :   A   B   C   D   E
                 Time :   3   4   2   6   2
Job 2   Sequence :   C   B   A   D   E
                 Time :   5   4   3   2   6

15.   a) Construct the arrow diagram comprising activities A, B, C, D, E, F, G such that the following relationships are satisfied :

Activities : A, B, C can start simultaneously.

Activities : A < F, E ;   B < D, C ;   C, D, E < G

(or)

b) The following are the details of estimated times of activities of a certain project.

Activities	Immediate predecessors	Estimated time(weeks)
A	--	2
B	A	3
C	A	4
D	B, C	6
E	--	2
F	E	8

i) Find the critical path and the expected time of the project.

ii) Calculate the earliest start time and earliest finish time for each activity.

Section –C   3 X 10 = 30

Answer any **THREE** Questions:

16. Solve graphically the following L.P.P. :

$$Maximize\ z = 3x_1 + 2x_2$$

subject to the constraints : $-2x_1 + x_2 \leq 1$, $x_1 \leq 2$,

$$x_1 + x_2 \leq 3\ ,\ x_1, x_2 \geq 0\ .$$

17. Use Simplex method to solve the L.P.P. :

$$Maximize\ z = 3x_1 + 2x_2 + 5x_3$$

Subject to the constraints: $x_1 + 2x_2 + x_3 \leq 430$, $3x_1 + 2x_3 \leq 460$,

$$x_1 + 4x_2 \leq 420;\ x_1,\ x_2,\ x_3 \geq 0.$$

18. Solve the transportation problem with unit transportation costs, demand and supplies as given below:

Destination

	D₁	D₂	D₃	D₄	Supply
S₁	3	7	6	4	5
S₂	2	4	3	2	2
S₃	4	3	8	5	3
Demand	3	3	2	2	

19. Solve the following sequencing problem giving an optimal solution if passing is not allowed.

Jobs	Machines (processing time in hours)			
	M1	M2	M3	M4
1	20	3	3	25
2	12	5	1	11
3	18	4	2	10
4	17	2	4	28

20. A project consists of eight activities with the following relevant information:

Activity	Immediate predecessor	Estimated duration (days)		
		Optimistic	Most likely	Pessimistic
A	--	1	1	7
B	--	1	4	7
C	--	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

(5)

(i) Draw the PERT network and find out the expected project completion time.

(ii) What duration will have 95% confidence for project completion?

(iii) If average duration for activity F increases to 14 days, what will be its effect on the expected project completion time which will have 95% confidence?

(For standard normal $Z = 1.645$, area under the standard normal curve from 0 to Z is 0.45).