I BSC (CS, IT)

And

BCA

2 mark

1. State the mathematical formulation of LPP.
2. State the canonical form of LPP
3. Define graphical solution form of LPP
4. Define feasible solution
5. Express the following LPP into standard form.

$$\text{Max } z = 4x_1 + 2x_2 + 6x_3$$

Sub to constaint

$$2x_1 + 3x_2 + 2x_3 \geq 6$$
$$3x_1 + 4x_2 \geq 8$$
$$6x_1 - 4x_2 + x_3 \leq 10, \quad x_1, x_2, x_3 \geq 0$$

6. Define standard form
7. Express the following LPP into canonical form

$$\text{Max } z = 2x_1 + 3x_2 + x_3$$

Sub to Constaint

$$4x_1 + 3x_2 + x_3 \leq 6$$
$$x_1 + 5x_3 - 7x_3 \geq 4$$

and $x_1, x_2, x_3 \geq 0$ and x_2 is unrestricted.

8. Define characteristics of the canonical form
9. Define slack
10. Define surplus
11. What is artificial variable
12. Define Big-M method
13. Write any one condition for big-M method
14. Define simplex method of LPP
15. Discuss the north west corner rule
16. what is transportation problem
17. what is types of transportation problem and give Example for types
18. How many methods in transporation problem
19. what is the initial basic feasible solution
20. what is unbalanced problem

21. Define Sequencing problem
22. Define total elapsed time(τ)
23. Define idle time
24. Define Graphical method
25. Define processing of n jobs 2 machine
26. Define processing of n jobs 3 machine
27. Define network
28. Define PERT
29. Define critical path
30. Define independent float
31. Define fulkerson's rule
32. What is the difference between PERT and CPM
33. Define term project Planning
34. What is dummy activity?
35. What is Assignment problem

5 marks

1. Express the following LPP into canonical form

$$\text{Max } z = 2x_1 + 3x_2 + x_3$$

sub to constaints

$$4x_1 - 3x_2 + x_3 \leq 6$$
$$x_1 + 5x_2 - 7x_3 \geq -4$$
$$x_1, x_2, x_3 \geq 0 \text{ and } x_2 \text{ is unrestricted}$$

2. using Graphical method

$$\text{Max } z = 4x_1 + 3x_2$$

sub to Constant

$$x_1 - x_2 \leq -1$$
$$-x_1 + x_2 \geq 0$$
$$x_1, x_2 \geq 0$$

3. Express the following LPP to Canonical form and Standard form

$$\text{Max } z = 2x_1 + 3x_2 + x_3$$

Sub to Constain

$$4x_1 - 3x_2 + x_3 \leq 6$$

$$x_1 + 5x_2 + x_3 \geq -4$$

$$x_1, x_2, x_3 \geq 0$$

4. Explain the Role of computer in OR

5. Explain the Procedure in mathematical formulation of LPP.

6. Explain the procedure in Graphical method.

7. Solve the following LPP by penality method

$$\text{Max } z = 3x_1 + 2x_2$$

Sub to Constaint

$$2x_1 + x_2 \leq 2$$

$$3x_1 + 4x_2 \geq 12$$

and $x_1, x_2 \geq 0$

8. Solve the following LPP by using big-M method,

$$\text{Min } z = 4x_1 + 3x_2$$

subject to constaints

$$2x_1 + x_2 \geq 10$$

$$-3x_1 + 2x_2 \leq 6$$

$$x_1 + x_2 \geq 6$$

and $x_1, x_2 \geq 0$

9. write down the algorithm for big-M method

10. write down the algorithm for simplex method

11. $\text{Max } z = 3x_1 + 2x_2 + 5x_3$, find using simplex method

subject to constaint

$$x_1 + 4x_2 \leq 420$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 2x_2 + x_3 \leq 430 \quad \text{and } x_1, x_2, x_3 \geq 0$$

12. Find using Charl's method (or) Penality method following LPP by Max $z = 3x_1 + 2x_2$

sub to Constaint

$2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$ and $x_1, x_2 \geq 0$

13. Find the non-negative value of simplex method

Max $z = 5x_1 + 3x_2$

Subject to Constraints

$x_1 + x_2 \leq 2$

$5x_1 + 2x_2 \leq 10$

$3x_1 + 8x_2 \leq 12$ and $x_1, x_2 \geq 0$

14. Find the initial basic feasible solution of the following transporat problem by Northwest corner cell method ~~and then optimize the solution~~

		Destination A	B	C	D	Supply
Source	I	3	1	7	4	250
	II	2	6	5	9	350
	III	8	3	3	2	400
Demand		200	300	350	150	

15. Find the initial basic feasible solution of the following transportation problem by Least cost method

	S_1	S_2	S_3	S_4	Supply
F_1	4	6	8	8	40
F_2	6	8	6	7	60
F_3	5	7	6	8	50
DEMAND	20	30	50	50	

16. Find the initial basic feasible solution of the following transportat problem in unbalanced problem by Least Cost method

		Destination I	II	III	Supply
Source	A	2	3	4	10
	B	5	7	9	30
	C	10	2	5	60
Demand		20	25	45	

17. Find the transporation using VAM

	Destination A	B	C	D	Supply
I	3	1	7	4	300
II	2	6	5	9	400
III	8	3	3	2	500
Demand	250	350	400	200	

18. Find mimum job assignment for given problem

	J_1	J_2	J_3	J_4
P_1	10	3	8	9
P_2	7	5	4	8
P_3	6	9	2	9
P_4	8	7	10	9

19. ~~Explain~~ write down the algorithm for northwest corner method

20. write down the algorithm for least cost corner method steps

21. write drown the algorithm of sequencing problem

22. There are two jobs to be processed through the 4 machines A, B, C and D through the processed time in hrs

Job 1 A B C D
Job 2 D B A C are given as follows

Jobs	Machine A	B	C	D
Jobs 1	2	4	5	1
2	6	4	2	3

23. Find the sequence that minimize the total elapsed time required to complete the following jobs on 3 machines in order A B C

Jobs	I	II	III	IV	V
M_1(A)	8	10	6	7	11
M_2(B)	5	6	2	3	4
M_3(C)	4	9	8	6	5

24. Find n Jobs m machines

Jobs / Machine	A	B	C	D	E
M_1	10	12	8	15	16
M_2	3	2	4	1	5
M_3	5	6	4	7	3
M_4	14	7	12	8	10

25 write down the steps for n Jobs on 2 machines 2.

26. Explain the estimate time in PERT

27. A project consists of 7 activities given below

Activity	A	B	C	D	E	F	G
Proceeding Activity	-	-	-	A,B	A,B	C,D,E	C,D,E
Duration (days)	4	7	6	5	7	6	5

3.

draw the network and find the Project length, Completion time and calculate the total float for each activity.

28. The following table indicates the details of a project that the determine are in days 'a' refer a optimistic time refers to most likely time 'b' refers to perisimistic time duration. 4.

Activity	1-2	1-3	1-4	2-4	2-5	3-5	4-5
a	2	3	4	8	6	2	2
m	4	4	5	9	8	3	5
b	5	6	6	11	12	4	7

Draw the network and find critical path and expected standard deviation of completion time.

29. Explain Fulkerson's rule

30. calculate the earliest start and finish time and total float and finish time of each activity of the Project given below 5.

Activity	1-2	1-3	2-4	3-4	3-6	4-9	5-6	5-7	6-8	7-8
Duration	4	1	1	1	6	5	4	8	1	2

10 Marks

1. A firm manufacture two types of product A and B and sell them out at a profit of rupees 2 on type A and profit of Rs 3 on type B. Each product processed on two mechine M_1 and M_2. Type A require one minute of processing time on M_1 and two minute on M_2. Type B requires one minute on M_1 and one minute on M_2. The mechine M_1 is available are not more than six hours 40 minutes will machine m_2 is available for 10 hrs during any working day formulate the problem as LPP & as to maximize the profit

2. using Graphical method

$$\text{Max } z = 2x_1 + 3x_2$$

subject to constaint

$$x_1 - x_2 \leq 2$$

$$x_1 + x_2 \geq 4 \quad \text{and} \quad x_1, x_2 \geq 0.$$

3. solve the following LPP by graphical method.

$$\text{Max } z \geq 3x_1 + 2x_2$$

subject to constaint

$$-2x_1 + x_2 \leq 1$$

$$x_2 \leq 2$$

$$x_1 + x_2 \leq 3 \quad \text{and} \quad x_1, x_2 \geq 0$$

4. Three products this products are processed on three different machines time required to manufacture 1 unit of each unit of three products and daily capacity on given table.

machine	Time per unit			mechine Capacity
	P	P	P	
M_1	2	3	2	440
M_2	4	–	3	470
M_3	2	5	–	430

It is required to determine the number of units to be manufacted for each product the profit per unit for product 1, 2, 3, 4 and 6 respectively it is measured that all the among produced are consumed in the market formulated the mathematical model for the Problems.

5. A firm Produces is having the following specific gravity ≤ 0.98, Chromium $\geq 8\%$, melting point $\geq 450^\circ c$. Raw material a, b and c have the properties showing the table can be used

Property	Raw material		
	A	B	C
Specific gravity	0.92	0.97	1.04
Chromium	7%	13%	16%
Melting point	440°C	490°C	480°C

Cost of various raw materials per unit can are Rs 90 for A, Rs 280 for B and Rs 40 for C. find the properties in which A, B and C used to obtain an alloy of desired properties which the cost of value material is minimum.

6. Solve two phase simplex method to use Max $z = 5x_1 + 8x_2$

subject to Constaints $3x_1 + 2x_2 \geq 3$

$x_1 + 4x_2 \geq 4$

$x_1 + x_2 \leq 5$ and $x_1, x_2 \geq 0$.

7. Solve the following LPP using Simplex method

Max $z = 4x_1 + 10x_2$

Subject to Constaints

$2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$ and $x_1, x_2 \geq 0$.

8. Explain briefly about two phase duality method

9. Solve the following LPP using Simplex method

Max $z = x_1 + 3x_2 + 6x_3$

Subject to Constaints

$x_1 + 5x_2 \leq 300$

$3x_1 + 2x_3 \leq 250$

$x_1 + 2x_2 + x_3 \leq 320$ and $x_1, x_2, x_3 \geq 0$.

10. Write algorithm about Charnel's method

11. Six machines & 5 jobs processing cost is given in table. make an assignment problem and find out optimal cost (minimization)

	J_1	J_2	J_3	J_4	J_5
M_1	6	2	5	2	6
M_2	2	5	8	7	7
M_3	7	8	6	9	8
M_4	6	2	3	4	5
M_5	9	3	8	9	7
M_6	4	7	4	6	8

11. Find the initial basic feasible solutions to following transportation Problem using VAM method and then optimize the situation using uv method.

Source	A	B	C	D	Supply
I	3	1	7	4	250
II	2	6	5	9	350
III	8	3	3	2	400
Demand	200	300	350	150	

12. write the algorithm of VAM method

13. write the algorithm of Assignment problem.

14. Find the initial basic feasible solution of following transportation Problem using Northwest and least cost method

	A	B	C	D	Supply
I	5	2	4	3	22
II	4	8	1	6	15
III	4	6	7	5	8
Demand	7	12	17	9	

15. Solve using assignment problem for 5 jobs to 5 mechine

machine \ Jobs	A	B	C	D	E
I	5	11	10	12	4
II	2	4	6	3	5
III	3	12	5	14	6
IV	6	14	4	11	7
V	7	7	8	12	5

16. write down the steps for n jobs m mechines and also Two jobs on n machines

17. Define no passing rule in a sequencing problem.

18. Find njbs m mechine.

machine / Jobs	A	B	C	D
M_1	18	17	11	20
M_2	8	6	5	4
M_3	7	9	8	8
M_4	2	6	5	4
M_5	10	8	7	8
M_6	25	19	15	12

19. What is a graphical method? How to using two jobs on m machines.

20. Two Jobs have to be processed through each of the machines the processing time on each machine and sequence of jobs

Job 1. A → C → D → B → E → F

Job 2 A → C → B → D → F → E

	Machine					
	A	B	C	D	E	F
Job 1	20	30	10	10	25	15
Job 2	10	15	30	10	20	15

In which order should jobs be done on each of the machine to maximize the total time to process the jobs? find the minimum elapsed time.

21. calculate the total float, free float and independent float for the project whose activity for given below

Activity	1-2	1-3	1-5	2-3	2-4	3-4	3-5	3-6	4-6	5-6
Duration (in weeks)	8	7	12	4	10	3	5	10	7	4

22. Construct the network for the Project whose the activity and three times estimates of the activities (in weeks) are given below.

i) Expect the duration of the each activity

ii) Expect the variance of each activity

iii) Expect the variance of the project length

Activity	1-2	2-3	2-4	3-5	4-5	4-6	5-7	6-7	7-8	7-9	8-10	9-10
t_o	3	1	2	3	1	3	4	6	2	1	4	3
t_m	4	2	3	4	3	5	5	7	4	2	6	5
t_p	5	3	4	5	5	7	6	8	6	3	8	7

23. A small project is composed of activities of given below

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
t_o	1	1	2	1	2	2	3
t_m	1	4	2	1	5	5	6
t_p	7	7	8	1	14	8	15

i) Draw the network ii) find the critical Path

iii) Determine the Expected Standard deviation of the Completion method

24. The data for a small PERT project is as given below

A	B	C	D	E	F	G	H	I	J	K
3	2	6	2	5	3	3	1	4	1	2
6	5	12	5	11	6	9	4	19	2	4
15	14	30	8	17	15	27	7	28	9	12

Procedure relationship A, B, C can start immediatly

A < D, I ; B < G, F ; D < G, F ; C < E ; E < H, K ;

F < H, K ; G, H < J

i) Draw the project network

ii) calculate the earliest and latest expected time to each node and find critical path

iii) Also find expected variance of the project length

25. A project has 9 activities, the expected time of each activity as follows.

Activity	1-2	1-3	2-4	3-4	4-6	5-6	3-5	5-7	6-7
Days	6	8	7	12	3	5	7	11	10

i) Draw the project work

ii) Identify the critical path

iii) Find the project duration

iv) What is the slack at each activity ?