B. Sc. DEGREE EXAMINATION, APRIL 2022
BRANCH I – MATHEMATICS
SIXTH SEMESTER

COURSE   : MAJOR ELECTIVE
PAPER   : OPTIMIZATION TECHNIQUES
TIME   : 3 HOURS   MAX. MARKS: 100

SECTION-A
ANSWER ANY TEN QUESTIONS: $10 \times 2 = 20$

1. Explain redundant constraint in the context of linear programming.

2. Define slack and surplus variables in a linear programming problem.

3. List the variations in the transportation problem.

4. Can degeneracy occur in a transportation problem? How is it resolved?

5. State the assignment model.

6. Mention the difference between transportation model and assignment model.

7. State the assumptions made in sequencing.

8. Explain Two-person zero-sum game.

9. Define the terms payoff matrix, pure strategy in game theory.

10. Name the three phases of project management.

11. Explain the rules devised by Fulkerson.

12. Give the merits and demerits of AON diagram.

SECTION-B
ANSWER ANY FIVE QUESTIONS: $5 \times 8 = 40$

13. Solve using graphical method:

    Maximize $Z = 2x_1 + x_2$

        subject to

    $x_1 + 2x_2 \leq 10; x_1 + x_2 \leq 6; x_1 - x_2 \leq 2; x_1 - 2x_2 \leq 1; \ x_1, x_2 \geq 0$

14. What is transportation problem? Write mathematical model for general transportation problem.

..2

15. Solve the following assignment problem:

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

16. Solve the following game by using the principle of dominance:

Player B

		I	II	III	IV	V	VI
	1	4	2	0	2	1	1
	2	4	3	1	3	2	2
Player A	3	4	3	7	-5	1	2
	4	4	3	4	-1	2	2
	5	4	3	3	-2	2	2

17. Solve the following game by graphical method.

B

		y_1	y_2	y_3
A	x_1	6	4	3
	$x_2 = 1 - x_1$	2	4	8

18. Consider the network shown in figure. The three time estimates for the activities are given along the arrows. Determine the critical path. What is the probability that the project will be completed in 20 days?
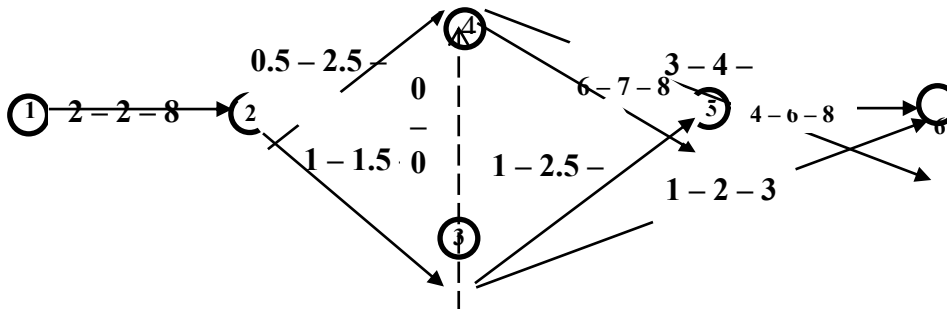
19. Explain the terms: (i) optimistic time (ii) pessimistic time (iii) most likely time and (iv) expected time in PERT networks.

..3

SECTION-C

ANSWER ANY TWO QUESTIONS: $2 \times 20 = 40$

20. Solve by simplex method the following LP problem:
     Minimize $Z = x_1 - 3x_2 + 3x_3$
     subject to $3x_1 - x_2 + 2x_3 \leq 7$
                  $2x_1 + 4x_2 \geq -12$
                  $-4x_1 + 3x_2 + 8x_3 \leq 10$
                  $x_1, x_2, x_3 \geq 0$

21. (a) Six jobs A, B, C, D, E and F have arrived at one time to be processed on a single
        machine. Assuming that no new jobs arrive thereafter, determine

Job	A	B	C	D	E	F
Processing time	7	6	8	4	3	5

   (i)   optimal sequence as per SPT rule
   (ii)   completion times of the jobs
   (iii) mean flow time
   (iv)   average in-process inventory

   (b) The utility data for a network are given below. Determine the total, free, independent
       and interfering floats and identify the critical path.

Activity:	$0-1$	$1-2$	$1-3$	$2-4$	$2-5$	$3-4$	$3-6$	$4-7$	$5-7$	$6-7$
Duration:	2	8	10	6	3	3	7	5	2	8

(10+10)

22. (a) A product is produced by four factories A,B,C and D. The unit production costs in them are
       Rs.2, Rs.3, Rs.1 and Rs.5 respectively. Their production capacities are: factory A-50 units, B-70
       units,C-30 units and D- 50 units. These factories supply the product to four stores, demands of
       which are 25,35,105 and 20 units respectively. Unit transportation cost in rupees from each
       factory to each store is given in the table below. Determine the extent of deliveries from each of
       the factories to each of the stores so that the total production and transportation cost is minimum.

		Stores			
		1	2	3	4
Factories	A	2	4	6	11
	B	10	8	7	5
	C	13	3	9	12
	D	4	6	8	3

   (b) Describe the various types of game models.   (15+5)

♠♠♠♠♠♠♠♠♠♠♠