SUBJECT CODE : 15MT/ME/OT55

B. Sc. DEGREE EXAMINATION, NOVEMBER 2019
BRANCH I - MATHEMATICS
FIFTH SEMESTER

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

SECTION – A

(10×2=20)

ANSWER ALL THE QUESTIONS

1. Define Operations Research.
2. State the canonical form of a LPP.
3. Define degeneracy in Transportation problem.
4. Define travelling salesman problem.
5. State the assumptions in sequencing problem.
6. Give the rule for solving n jobs on three machines.
7. Define strategy.
8. Define rectangular pay off matrix.
9. Define critical path.
10. What are the three time estimates in PERT?

SECTION – B

(5×8=40)

ANSWER ANY FIVE QUESTIONS

11. Solve the following LPP graphically:
    Maximise $Z = 8x_1 + x_2$
            Subject to $8x_1 + x_2 \leq 8$
                    $2x_1 + x_2 \leq 6$
                    $3x_1 + x_2 \leq 6$
                    $x_1 + 6x_2 \leq 8$
                    $x_1, x_2 \geq 0$

12. Solve the following assignment problem

Machines

		M_1	M_2	M_3	M_4
	J_1	5	7	11	6
	J_2	8	5	9	6
Jobs	J_3	4	7	10	7
	J_4	10	4	8	3

..2

13. A manufacturing company processes 6 different jobs on two machines A and B. The number of units of each job and its processing times on A and B are given in the table below. Find the optimal sequence, the total minimum elapsed and idle time for each machine.

Job no.	No. of units of each job	Processing time (Minutes)	
		Machine A	Machine B
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

14. A salesman wants to visit cities A, B, C, D and E. He does not want to visit any city twice before completing his tour of all the cities and wishes to return to the point of starting journey. Cost of going from one city to another (in rupees0 is given below. Find the least cost route.

	A	B	C	D	E
A	0	2	5	7	1
B	6	0	3	8	2
C	8	7	0	4	7
D	12	4	6	0	5
E	1	3	2	8	0

15. Solve, using dominance property, the following game:

Player B

		I	II	III	IV
	I	3	2	4	0
Player A	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

16. A project consists of the following activities. Draw the CPM network, obtain E and L and identify the critical path.

Activity	1-2	1-3	1-4	2-3	2-4	2-5	3-5	4-5
Time(Days)	5	4	6	7	8	10	11	10

17. Differentiate between CPM and PERT.

SECTION – C   (2X20=40)

ANSWER ANY TWO QUESTIONS

18. (a) Solve the following LPP using simplex procedure:

Maximise $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8$

$x_1, x_2, x_3 \geq 0$

(b) Solve the following LPP by big M method

Maximise $Z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 3$

$x_2 \leq 4$

$x_1, x_2 \geq 0$

19. (a) Solve the following Transportation problem

	W_1	W_2	W_3	W_4	W_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	100

(b) Use graphical method to minimise the time required to process the following jobs on the machines i.e., for each machine specify the job which should be done first. Also calculate the total elapsed time to complete both the jobs.

Job 1	Sequence	A	B	C	D	E
	Time (hr.)	6	8	4	12	4
Job 2	Sequence	B	C	A	D	E
	Time (hr.)	10	8	6	4	12

20. (a) Solve the following game by graphical method:s

Player B

Player A

	y_1	y_2	y_3	y_4
x_1	19	6	7	5
x_2	7	3	14	6
x_3	12	8	18	4
x_4	8	7	13	-1

(b) A small project consists of 7 activities whose time estimates are listed in the table below:

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Optimistic Time	1	1	2	1	2	2	3
Most Likely Time	1	4	2	1	5	5	6
Pessimistic Time	7	7	8	1	14	8	15

(i)   Draw the project network and identify all the paths through it.
(ii)   Find the expected duration and variance of each activity.
(iii)   What is the expected project length?
(iv)   Calculate the variance and standard deviation of the project length.
(v)   What is the probability that the project will be completed at least three weeks earlier than expected?
(vi)   If the project due date is 18 weeks what is the probability of not meeting the due date?
(vii)   What due date has about 90% chance of being met?

☛☛☛☛☛☛☛