

23. Solve the following sequencing problem of 4 – jobs on 6 – machines (processing time in hrs) machines.

Job	Machines					
	M ₁	M ₂	M ₃	M ₄	M ₅	M ₆
A	19	8	8	3	11	24
B	18	6	9	6	9	18
C	12	5	8	5	7	15
D	20	5	3	4	8	11

24. Calculate the earliest start, earliest finish, Latest start and Latest finish of each activity of the project given below and determine the critical path method of the project.

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

NOVEMBER 2019

51311/SAZ5C

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer any TEN questions.

1. Define Operation Research.
2. What is Optimum Solution?
3. What are basic variables?
4. Define slack variable.
5. Define basic feasible solution.
6. Define assignment problem.
7. State dominance property.
8. What is mixed strategy?
9. Define total elapsed time.
10. Write the use of Monte-Carlo method.
11. Define critical path.
12. Why do we go for simulation?

SECTION B — (5 × 5 = 25 marks)

Answer any FIVE questions.

13. Describe the characteristics of operation research.
14. Write the dual of the following primal LP problem
 Minimize $z = 4x_1 + 5x_2 - 3x_3$
 Subject to constraints
 $x_1 + x_2 + x_3 = 22$
 $3x_1 + 5x_2 - 2x_3 \leq 65$
 $x_1 + 7x_2 + 4x_3 \leq 120$
 $x_1 \geq 0, x_2 \geq 0$ and x_3 unrestricted.
15. Write an algorithm for Charnes method of penalties.
16. Solve the transportation problem.
- | | | | | | | |
|--------|--|----|---|---|---|--------|
| | | To | | | | Supply |
| | | 1 | 2 | 3 | 4 | 6 |
| From | | 4 | 3 | 2 | 0 | 8 |
| | | 0 | 2 | 2 | 1 | 10 |
| Demand | | 4 | 6 | 8 | 6 | |
17. Write an algorithm for matrix minima and Vogel's approximation methods.
18. Solve the game whose pay-off matrix is given by
- | | | | | |
|----------|-------|----------|-------|-------|
| | | Player B | | |
| | | B_1 | B_2 | B_3 |
| Player A | A_1 | 1 | 3 | 1 |
| | A_2 | 0 | -4 | -3 |
| | A_3 | 1 | 5 | -1 |
19. What are the advantages and limitations of simulation?

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. Solve the following LP problem by Simplex method.
 Minimize $z = 8x_1 - 2x_2$
 Subject to constraints.
 $-4x_1 + 2x_2 \leq 1$
 $5x_1 - 4x_2 \leq 3$ and $x_1, x_2 \geq 0$.
21. Use two phase simplex method to
 Maximize $z = 5x_1 + 3x_2$
 Subject to constraints
 $2x_1 + x_2 \leq 1$
 $x_1 + 4x_2 \geq 6$ and $x_1, x_2 \geq 0$
22. The assignment cost of assigning any one operator to any one machine is given in the following table.

		Operators			
		I	II	III	IV
Machine	A	10	5	13	15
	B	3	9	18	3
	C	10	7	3	2
	D	5	11	9	7

Find the optimal assignment by Hungarian method.