Reg. No. :

Question Paper Code: 46704

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Sixth Semester

Mechanical Engineering

14UME604 - OPREATIONS RESEARCH

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

(Smith chart may be permitted)

PART A - (10 x 1 = 10 Marks)

1. In simplex method, if there is tie between a decision variable and a slack (or surplus) variable, ----------------- should be selected

   (a) Slack variable   (b) Surplus variable
   (c) Decision variable   (d) None of the above

2. In the simplex method, variables that are assigned zero values are called

   (a) Basic variables   (b) Non-basic variables
   (c) slack variables   (d) artificial variables.

3. The optimality of a transportation problem is determined by the application of

   (a) least cost method   (b) north west corner method
   (c) vogel's approximation method   (d) modi method

4. In a n x n matrix of an assignment problem, the optimality is reached when the minimum number of straight line scoring all the zero is

   (a) n^2 (b) $1/n$ (c) n   (d) n/2

5. PERT and CPM are

       (a) techniques to determine project status

       (b) decision making techniques

       (c) aids to determine the cost implications of project

       (d) aids for decision making

6. A dummy activity is used in PERT network to represent

      (a) Precedence relationship   (b) Necessary time delay

      (c) Resource constrains   (d) Idle resource.

7. Replacement of an existing machine aims at

       (a) lower average annual cost of using the machine

       (b) reduction in annual capital cost

       (c) lesser dependence on workmen

       (d) more automation

8. Group replacement policy is applicable for

      (a) repairable items   (b) items that fail partially

      (c) items that fail completely   (d) dissimilar items

9. It may not be _____ to totally avoid queue.

      (a) economical   (b) bad   (c) correct   (d) proper

10. When a game has a pure strategy

      (a) Each player selects a particular strategy

      (b) Players select their strategies arbitrarily

      (c) both players select their optimal strategies

      (d) none of the above

PART - B (5 x 2 = 10 Marks)

11. List any four requirement of employing linear programming problem techniques.

12. Distinguish between transportation problem and assignment problem.

13. Define parallel critical path.

14. Name the inventory control systems adopted in practice.

15. Classify the queuing models.

<div align="center">PART - C (5 x 16 = 80 Marks)</div>

16. (a) Solve the following programming problem using graphical method.

Maximize $Z = 100X_1 + 80X_2$

Subject to

$5X_1 + 10X_2 \leq 50$

$8X_1 + 2X_2 \geq 16$

$3X_1 - 2X_2 \geq 6$

X_1 and $X_2 \geq 0$. (16)

<div align="center">Or</div>

(b) Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$,

subject to $x_1 + 2x_2 + 3x_3 = 15$,

$2x_1 + x_2 + 5x_3 = 20$,

$x_1 + 2x_2 + x_3 + x_4 = 10$, (16)

17. (a) Consider the given table are involving three source and four destinations as reproduced below. The cell entries represent the cost of transportation per unit.

<div align="center">Destination</div>

		1	2	3	4	Supply
	1	3	1	7	4	300
Source	2	2	6	5	9	400
	3	8	3	3	2	500
	Demand	250	350	400	200	

Obtain the initial basic solution using the northwest corner method and then optimize solution using U-V method. (16)

<div align="center">Or</div>

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(b) Solve the given assignment problem using hungerian method. The matrix entities represent the processing times in hours. (16)

Job \ operator →	1	2	3	4	5
1	10	12	15	12	8
2	7	16	14	14	11
3	13	14	7	9	9
4	12	10	11	13	10
5	8	13	15	11	15

18. (a) The following table gives the activities and duration of a construction project.

Activity	1-2	1-3	1-4	2-5	2-6	3-5	3-6	4-5	4-6	5-7	6-7
Duration	10	15	20	8	6	10	7	15	10	20	15

Draw the network for the project. Find the maximum flow. (16)

Or

(b) Consider the following problem involving activities from A to Z.

Activity	A	B	C	D	E	F	G	H	I	J
Immediate predecessor(s)	-	A	A	A	D	D	E	F, G	C,H	B
Duration (months)	1	4	2	2	3	3	2	1	3	2

(i) Construct the CPM network

(ii) Determine the critical path

(iii) Compute total floats and free float for non-critical activity. (16)

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19. (a) (i) The cost of a machine is Rs.61000 and its scrap value is Rs.1000. The maintenance cost found from past experience is as follows:

Year	1	2	3	4	5	6	7	8
Maintenance cost	1000	2500	4000	6000	9000	12000	16000	20000

When should the machine be replaced? (8)

(ii) Classify the replacement study and also show the economic life of an assert. (8)

Or

(b) (i) The cost of a machine is Rs.61000 and its scrap value is Rs.1000. The maintenance cost found from past experience are as follows:

Year	1	2	3	4	5	6	7	8
Maintenance cost	1000	2500	4000	6000	9000	12000	16000	20000

When should the machine be replaced? (16)

20. (a) Write about strain gauges on rotating shafts. (16)

Or

(b) Consider the 4×4 game played by players A and B and solve it optimality. (16)

Player B

		1	2	3	4
	1	6	2	4	8
Player	2	2	-1	1	12
A	3	2	3	3	9
	4	5	2	6	10

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