Reg. No. :

Question Paper Code: 41764

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Sixth Semester

Mechanical Engineering

14UME604 - OPREATIONS RESEARCH

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The mathematical technique for finding the best use of limited resources in an optimum manner is known as

    (a) operations research   (b) linear programming
    (c) network analysis   (d) Least queuing theory

2. A constraint is expressed as $X_2 \geq 3$. It is converted in to the form of an equation as

    (a) $X_1 + X_2 + S_1 + \alpha_1 = 3$ (b) $X_1 + X_2 - S_1 - \alpha_1 = 3$
    (c) $X_1 + X_2 - S_1 + \alpha_1 = 3$ (d) $X_1 + X_2 + S_1 - \alpha_1 = 3$

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. The probability distribution of project completion in PERT follows _____ distribution.

    (a) normal   (b) binomial   (c) beta   (d) gaussian

6. 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

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. A common assumption about the players in a game is that

    (a) neither player knows the payoff matrix

    (b) the players have different information about the payoff matrix

    (c) only one of the players pursues a rational strategy

    (d) the specific identity of the players is irrelevant to the play of the game

<div align="center">PART - B (5 x 2 = 10 Marks)</div>

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) Consider the given linear programming model and solve it using the simplex method.

    Maximize $Z = 6X_1 + 8X_2$

    Subject to $5X_1 + 10X_2 \leq 60$

    $4X_1 + 4X_2 \leq 40$

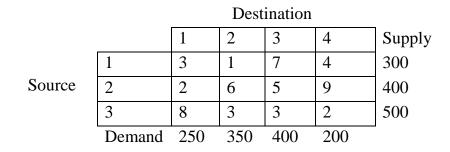 X_1 and $X_2 \geq 0$.   (16)

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

(b) 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)

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)

Or

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

operator → Job ↓	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

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(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)

19. (a) (i) Explain different types of cost in inventory system and also list the models of inventory. (6)

(ii) A textile mill buys its raw material from a vendor. The annual demand of the raw material is 9000 units. The ordering cost is Rs.100 per order and the carrying cost is 20% of the purchase price per unit month, where the purchase price per unit is Rs. 1. Find the following: (i) EOQ (ii) Total cost w.r.t EOQ (iii) Number of orders per year (iv) Time between consecutive two orders. (10)

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? (8)

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

20. (a) The arrival rate of customers at the single window booking counter of a two wheeler agency follows Poisson distribution and service time follows exponential distribution. Hence the service rate also follows Poisson distribution. The arrival rate and the service rate are 25 customers/hr and 35customers/hr respectively. Find the following:

(i) Utilization of the booking clerk
(ii) Average number of waiting customers in the queue

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(iii) Average number of waiting customers in the system

(iv) Average waiting time per customer in the system

(v) Average waiting time per customer in the system (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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