Hall Ticket No | | | | | | | | | | | Question Paper Code: AME021

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech VI Semester End Examinations (Regular) - May, 2019

Regulation: IARE – R16

OPERATIONS RESEARCH

Time: 3 Hours **(ME)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) What are the main characteristics of operations research? Explain with suitable examples. **[7M]**

   (b) Solve the following problem by Simplex method **[7M]**

   Maximize Z = $5x_1 + 3x_2$
   subject to constraints $3x_1 + 5x_2 \leq 15$
   $5x_1 + 2x_2 \leq 10$
   and $x_1, x_2 \geq 0$

2. (a) Explain the graphical method of solving LPP. State its limitations. **[7M]**

   (b) A firm manufacturers four different machine parts A,B,C and D using copper and zinc. The requirement of copper and zinc for each part and their availability and the profit earned from each part are given in Table 1.

Table 1

Item	Requirement(Kg)		Profit
	copper	zinc	(RS)
A	5	2	12
B	4	3	8
C	2	8	14
D	1	1	10
Availability	100	75	

How many of each part should be manufactured to maximize the profit. **[7M]**

UNIT – II

3. (a) Define degeneracy? How the degeneracy during initial stage of transportation problem solving is resolved? **[7M]**

   (b) A company is spending in thousands(Rs) on transportation of its units from plants to four distribution centres. The supply and demand of units, with unit cost of transportation are given in thousands(Rs) in Table 2. Find the initial basic feasible solution. **[7M]**

Table 2

Plants	D1	D2	D3	D4	Availability
P1	19	30	50	12	7
P2	70	30	40	60	10
P3	40	10	60	20	18
Requirements	5	8	7	15	

4. (a) Explain how an assignment problem can be treated as a linear programming problem. **[7M]**

   (b) Five men are available to do five jobs. From past records, the time (in hours) that each man takes to do each job is known and is given in the following Table 3. **[7M]**

Table 3

	Jobs					
		I	II	III	IV	V
men	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

Find out how men should be assigned to the jobs in a way that will minimize the total time taken.

UNIT – III

5. (a) Explain the importance of sequencing problem. What are the various methods of solving sequencing problems? Briefly explain them. **[7M]**

   (b) Determine the sequence which minimises the total time for processing five jobs on three machines A,B & C in the order A,B and C. Processing in hours are given in Table 4. **[7M]**

Table 4

Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

6. (a) Explain Johnson's algorithm for processing 'n' jobs through two machines for a given machine order. **[7M]**

(b) A garment manufacturer has to process 5 items through three stages, viz. cutting, sewing and pressing. The time taken for each of these items at the different stages is shown in minutes in the following Table 5. **[7M]**

Table 5

	J1	J2	J3	J4	J5
Cutting Ai (Machine A)	40	90	80	60	50
Sewing Bi (Machine B)	50	60	20	30	40
Pressing Ci (Machine C)	80	100	60	70	110

Find an order in which these items are to be processed through these stages so as to minimize the total time involved.

UNIT – IV

7. (a) Discuss the step by step procedure of application of principle of dominance for solving game theory problem. **[7M]**

   (b) An aircraft company uses rivets at a constant rate of 2,500 per year. Each unit costs Rs. 30. The company personnel estimate that it costs Rs.130 to place an order, and that the carrying cost of inventory is 10 percent per year. How frequently should orders be placed? Also determine the optimum size of each order. **[7M]**

8. (a) Define inventory. Explain briefly the costs involved in inventory. **[7M]**

   (b) Find the optimum order quantity for a product of which the price breaks are as given in Table 6.

Table 6

Quantity	Unit cost (RS)
$0 < q < 500$	10
$500 \leq q < 750$	9.25
$750 \leq q$	8.75

The monthly demand for the product is 200 units, inventory carrying cost is 12% of the unit cost and cost of ordering is Rs.100. **[7M]**

UNIT – V

9. (a) Discuss the elements of structure of queuing system. **[7M]**

   (b) In a store with one server, 9 customers arrive on an average of 5 minutes. Service is done for 10 customers in 5 minutes, find **[7M]**

   i) The average no of customers in the system

   ii) The average queue length

   iii) The average time a customer spends in the store.

   iv) The average time a customer waits before being served.

10. (a) Explain the role of simulation in operations research studies. Give some important applications of queuing theory. **[7M]**

(b) Customers arrive at box office windows being manned by a single individual, according to a Poisson input process with a mean rate of 20/hr. The time required to serve a customer has an exponential distribution with a mean of 90 sec. Find the average waiting time of customers. Also determine the average number of customers in the system and average queue length. **[7M]**