Total No. of Questions: 6 *Total No. of Printed Pages:2*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2022

ME3EI02-Operation Research

Programme: B.Tech. Branch/Specialisation:

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Operations research is the application of _____methods to arrive at the optimal Solutions to the problems. **1**
a) economical b) scientific c) a and b both d) artistic

ii. Operations research is based upon collected information, knowledge and advanced study of various factors impacting a particular operation. This leads to more informed ----------. **1**
a) Management processes b) Decision making
c) Procedures d) None of these

iii. When the total supply is not equal to total demand in a transportation problem then it is called **1**
a) Balanced b) Unbalanced c) Degenerate d) None of these

iv. Optimal solution of an assignment problem can be obtained only if **1**
a) Each row & column has only one zero element
b) Each row & column has at least one zero element
c) The data is arrangement in a square matrix
d) None of the above

v. Identify the odd one out with respect to queuing theory. **1**
a) Shelving b) Reneging c) balking d) Jockeying

vi. The full form of CPM is _____ **1**
a) Critical Path Method b) Control Path Method
c) Critical Plan Management d) Control Path Management

vii. In game theory, a situation in which one firm can gain only what another firm loses is called a **1**
a) nonzero-sum game. b) prisoners' dilemma.
c) zero-sum game. d) cartel temptation.

viii. In decision making under _____, there are several possible outcomes for each alternative, and the decision maker knows the probability of occurrence of each outcome. **1**
a) risk b) utility c) certainty d) probability

ix. The following classes of costs are usually involved in inventory decisions except **1**
a) Cost of ordering b) Carrying cost
c) Cost of shortages d) Machining cost

x. 'Buffer stock' is the level of stock **1**
a) Half of the actual stock
b) At which the ordering process should start
c) Minimum stock level below which actual stock should not fall
d) Maximum stock in inventory

Q.2 i. Discuss the objective of Operations Research. **3**

ii. A company manufactures two products, *X* and *Y* by using three machines *A*, *B*, and *C*. Machine *A* has 4 hours of capacity available during the coming week. Similarly, the available capacity of machines *B* and *C* during the coming week is 24 hours and 35 hours respectively. One unit of product *X* requires one hour of Machine *A*, 3 hours of machine *B* and 10 hours of machine *C*. Similarly, one unit of product *Y* requires 1 hour, 8 hour and 7 hours of machine *A*, *B* and *C* respectively. When one unit of *X* is sold in the market, it yields a profit of Rs. 5/- per product and that of *Y* is Rs. 7/- per unit. Solve the problem by using graphical method to find the optimal product mix. **7**

OR iii. Solve the following problem using simplex method **7**
Maximise $Z = 23\ a + 32\ b$ S.T.
$10\ a + 6\ b \leq 2500$
$5\ a + 10\ b \leq 2000$
$1\ a + 2\ b \leq 500$
And both a and b are ≥ 0.

Q.3 i. List out the differences and similarities between Resource allocation model and Transportation model in linear programming. **3**

ii. Explain the procedure of getting basic feasible solution by using VAM. **7**

OR iii. There are 3 jobs A, B, and C and three machines X, Y, and Z. All the jobs can be processed on all machines. The time required for processing job on a machine is given below in the form of matrix. Make allocation to minimize the total processing time. **7**

Jobs	X	Y	Z
A	11	16	21

B	20	13	17
C	13	15	12

Q.4 i. Explain with suitable examples about the queue. Why do you consider the study of waiting line as an important aspect? **3**

ii. A company manufacturing plant and equipment for chemical processing is in the process of quoting tender called by public sector undertaking. Help the manager to find the project completion time to participate in the tender. **7**

S No	Activities		Days
1	A	-	3
2	B	-	4
3	C	A	5
4	D	A	6
5	E	C	7
6	F	D	8
7	G	B	9
8	H	E, F,G	3

OR iii. The arrivals at a telephone booth are considered to be following Poisson law of distribution with an average time of 10 minutes between one arrival and the next. Length of the phone call is assumed to be distributed exponentially with a mean of 3 minutes. **7**
(a) What is the probability that a person arriving at the booth will have to wait?
(b) What is the average length of queue that forms from time to time?
(c) The telephone department will install a second booth when convinced that an arrival would
expect to wait at least thee minutes for the phone. By how much must the flow of arrivals be
increased in order to justify a second booth?

Q.5 i. What is a decision? Differentiate between programmed and non-programmed decisions. **3**

ii. Explain Monte Carlo simulation in detail. **7**

OR iii. Solve the game whose payoff matrix is: **7**

	B1	B2	B3
A1	1	7	2
A2	6	2	7
A3	5	1	6

Q.6 Attempt any two:

i. The demand for an item is 8000 units per annum and the unit cost is Re.1/-. Inventory carrying charges of 20% of average inventory cost and ordering cost is Rs. 12.50 per order. Calculate optimal order quantity, optimal order time, optimal inventory cost and number of orders. **5**

ii. A producer has to supply 12,000 units of a product per year to his customer. The demand is fixed and known, and backlogs are not allowed. The inventory holding cost is Rs.0.20 per unit per month and the set-up cost per run is Rs. 350/- per run. Determine (a) the optimal lot size, (b) Optimum scheduling period, (c) Minimum total expected yearly cost. **5**

iii. A particular item has a demand of 9,000 units per year. The cost of one procurement is Rs. 100/- and the holding cost per unit is Rs. 2.40 per year. The replacement is instantaneous and no shortages are allowed. Determine: (*a*) Economic lot size, (*b*) The number of orders per year, (*c*) The time between orders, and (*d*) the total cost per year if the cost of one units is Re.1/-. **5**

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Scheme of Marking

MEDI-CAPS UNIVERSITY Knowledge is Power	Faculty of Engineering End Sem (Odd) Examination Dec-2022 ME3EI02-Operation Research
	Programme: B.Tech. | | Branch/Specialisation:

Note: The Paper Setter should provide the answer wise splitting of the marks in the scheme below.

Q.1	i)	b) scientific	**1**
	ii)	b) Decision making	**1**
	iii)	b) Unbalanced	**1**
	iv)	b) Each row & column has at least one zero element	**1**
	v)	a) Shelving	**1**
	vi)	a) Critical Path Method	**1**
	vii)	c) zero-sum game	**1**
	viii)	a) risk	**1**
	ix)	d) Machining cost	**1**
	x)	c) Minimum stock level below which actual stock should not fall	**1**
Q.2	i.	Discussing 3 objective of Operations Research. 3 marks	
	ii.	Formulating mathematical model 3 marks Finding solution 4 marks	
OR	iii.	Drawing 1st table…… 2 marks Drawing 2nd table……3 marks Drawing 3rd table and obtaining solution……3 marks	
Q.3	i.	Writing 3 diffrences……3 Marks	
	ii.	Explaining procedure ……7 marks	
OR	iii.	Finding optimium allocation…… 5 marks Finding solution……. 2 marks	
Q.4	i.	Explain with suitable examples about the queue…….3.5 marks Why do you consider the study of waiting line as an important aspect…….. 3.5 Marks	
	ii.	Drawing network diagram…….4 marks Finding projection completion time……..3 marks	
OR	iii.	(a) What is the probability that a person arriving at the booth will have to wait……2 marks (b) What is the average length of queue that forms from time to time…….2 marks (c) The telephone department will install a second booth when convinced that an arrival would expect to wait at least thee minutes for the phone. By how much must the flow of arrivals be increased in order to justify a second booth…….3 marks	
Q.5	i.	What is a decision…….. 3 marks Differentiate between programmed and non-programmed decisions……4 marks	
	ii.	Explain Monte Carlo simulation in detail.	
OR	iii.	Applying dominance rule……3 marks Finding solution using method of oddments…….3 marks Finding saddle point……. 1 marks	

	B1	B2	B3
A1	1	7	2
A2	6	2	7
A3	5	1	6

Q.6		Attempt any two:	
	i.	Calculate optimal order quantity, …….1.5 marks optimal order time, …….1.5 marks optimal inventory cost ……..1 marks number of orders….. 1 marks	
	ii.	Determine (a) the optimal lot size, ……..1.5 marks (b) Optimum scheduling period, ……1.5 marks (c) Minimum total expected yearly cost….. 2 marks	
	iii.	Determine: (*a*) Economic lot size, , …….1.5 marks (*b*) The number of orders per year, …….1.5 marks (*c*) The time between orders, and ……..1 marks (*d*) the total cost per year if the cost of one units is Re.1/-……..1 marks	

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	iii.	Determine: (*a*) Economic lot size, , ...1.5 marks (*b*) The number of orders per year, ...1.5 marks (*c*) The time between orders, and .....1 marks (*d*) the total cost per year if the cost of one units is Re.1/-.....1 marks	5

	B1	B2	B3
A1	1	7	2
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