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SUBJECT CODE NO:- H-4023
FACULTY OF SCIENCE AND TECHNOLOGY
Final B.Tech. (Mech) (Sem-VII)
Open Elective-II
Operations Research
[Revised]

[Time: Three Hours] **[Max.Marks: 80]**

Please check whether you have got the right question paper.

N.B 1)Q 1 from Section A &Q6 from Section B are compulsory.
2) Solve any two questions from each section other than Q1 & Q6.
3) Assume suitable data, if required.

Section A

Q.1 Attempt any five: 10

1. What is the role of O.R in Engineering?
2. What is Iterative procedure?
3. What are the characteristics of linear programming problem?
4. Define slack variables.
5. What is the relation between assignment and transportation problem?
6. What is an unbalanced transportation problem?
7. Write a historical note in brief about Operation Research?

Q.2 a) An aero plane can carry a maximum of 250 passengers. A profit of Rs. 1500 is made on each executive class ticket & a profit of Rs. 900 is made on each economy class ticket. The airline reserves at least 30 seats for executive class. However at least 4 times as many passengers prefer to travel by economy class then by executive class. Formulate this problem as a LPP & solve graphically. 10

b) Explain the phases of O.R. 05

Q.3 Solve the following LPP by simplex method. 15

Maximize $Z = 4X_1 + 3X_2$

Subject to constraints,

$$3X_1 + 6X_2 \leq 18$$
$$6X_1 + 4X_2 \leq 24$$
$$X_1, X_2 \geq 0$$

Q.4 Table below shows unit transportation cost from various go-downs to market area with their capacity & requirements. Find IBFS using Vogel's approximation method & also find the optimum solution. 15

	M1	M2	M3	M4	Capacity
G1	15	20	22	24	100
G2	18	17	12	10	200
G3	11	9	5	13	250
Requirement	75	75	275	125	

Q.5 Five new machines are to be located in a machine shop; there are five possible locations in which the machine can be located. The cost of placing machine at various locations is given in the table below: 15

	Location 1	Location 2	Location 3	Location 4	Location 5
Machine 1	20	23	18	10	16
Machine 2	50	20	17	16	15
Machine 3	60	30	40	55	8
Machine 4	6	7	10	20	25
Machine 5	18	19	28	17	60

It is required to place the machine at suitable location so as to minimize the total cost.

A) Formulate an L.P model to find an optimal assignment.

B) Solve the following assignment problem for minimum optimal cost.

Section B

Q.6 Attempt any five: 10

1) Explain pure and mixed strategy.
2) What is meant by Queue Discipline?
3) Define idle time on a machine in a sequencing problem.
4) What is economical order quantity?
5) What is the difference between individual and group replacement?
6) What is meant by critical path?
7) Define event float in CPM.

Q.7 a) A firm is considering replacement of a machine, whose cost is Rs. 12,200/- and the Scrap Value is Rs.200/- The running (Maintenance and operating) cost in rupees are found from experience to be as follows. When should the machine be replaced? 08

Year	1	2	3	4	5	6	7	8
Running Cost (Rs)	200	500	800	1200	1800	2500	3200	4000

b) A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at RS. 50 per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs. 75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find (a) the economic lot size (b) No. of orders per year. 07

Q.8 a) Determine the optimum strategies and the value of the following games. 08

		B		
	-3	4	2	9
A	7	8	6	10
	6	2	4	-1

b) Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order A-B-C as shown in the below table. Also find the total elapsed time. 07

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

Q.9 a) The arrival rate of a customer at a service window of a cinema hall follows a probability distribution with a mean rate of 45 per hour. The service rate of the clerk follows Poisson distribution with a mean of 60 per hour. Find. 08

1) Average number of customer in the system (Ls)
2) The average queue length (Lq)
3) The average waiting time in the system (Ws)
4) The average waiting time in the queue (Wq)

b) Draw the network diagram, calculate the EST and LFT, total float and project duration and show critical path on network for following data. 07

Activity	Time in days	Pre-operation
A	5	None
B	6	A
C	5	B
D	4	A
E	3	D
F	4	C,E

Q.10 For a project,normal time,crash time,normal cost and crash costs are given in the table. Contract the network by crashing it to optimum value and calculate the optimum project cost. Indirect cost is given as Rs. 100/- per day. 15

Activity	Time (days)		Cost (Rs)	
	Normal	Crash	Normal	Crash
1-2	3	2	300	400
2-3	6	4	480	520
2-4	7	5	2100	2500
2-5	8	6	400	600
3-4	4	3	320	360
4-5	5	4	500	520