B.E. / B.Tech. Mechanical Engineering (Model Curriculum) Semester-VI
OEC3021 / OPER1 - Operations Research Techniques

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Notes : 1.   All questions carry equal marks/marks as indicated.
         2.   Due credit will be given to neatness and adequate dimensions.
         3.   Assume suitable data wherever necessary.
         4.   Illustrate your answers wherever necessary with the help of neat sketches.
         5.   Solve Q. 1 or. Q. 2, Q.3 or Q. 4, Q.5 or Q. 6, Q.7 or Q.8, Q.9 or Q. 10.
         6.   Use of Normal distribution chart is permitted.
         7.   Use of Non programmable calculator is permitted.

1.   a)   Explain various Phases of OR in detail.   **8**

     b)   Explain in detail necessity of operations Research in Industry.   **8**

OR

2.   Solve the L.P problem by simplex method.   **16**
          $\text{Min } Z = 2y_1 + 3y_2$

          Sub to, $y_1 + y_2 \geq 5$

                     $y_1 + 2y_2 \geq 6$

                     $y_1, y_2 \geq 0$

3.   At the end of the cycle of schedule a transporting firm has a surplus of one vehicle in each   **16**
          of the cities 1,2,3,4, and 5 and to each vehicle A, B, C, D, E, and F. The cost in (Rs) of
          transportation and handling between the cities with a surplus and the cities as shown in
          following table. Find the assignment of surplus vehicle to each city that will result in a
          minimum total cost, which city will not receive a vehicle. Assign appropriate combination.

Surplus vehicle / Deficit Cities	A	B	C	D	E	F
1	134	116	167	230	194	97
2	114	195	260	116	178	130
3	129	117	48	94	66	101
4	71	156	92	143	114	136
5	97	134	125	83	142	118

OR

4. Find the optimum solution to the transportation problem given below in the table. **16**

	W$_1$	W$_2$	W$_3$	W$_4$	Supply
F$_1$	14	25	45	5	6
F$_2$	65	25	35	55	8
F$_3$	35	3	65	15	16
Demand	4	7	6	13	

5. A project consist of 9 activities. The details of the project are given in the table, **16**

Activity	Depends on	Time(days)
A	-	10
B	A	5
C	B	15
D	B, E, I	5
E	A	1
F	E,I	7
G	-	12
H	G	6
I	G	5

Construct a network to represent the project
Find out
A) Critical path
B) Establish free float, independent float for activity E, H and D.

OR

6. A following table give activity in construction project and other relevant data. **16**

Activity	Depends on	Normal		Crash	
		Time (Days)	Cost (Rs.)	Time (Days)	Cost (Rs.)
A	-	20	600	17	720
B	-	25	200	25	200
C	A	10	300	8	440
D	A	12	400	6	700
E	B,C	5	300	2	420
F	D,E	10	300	5	600

Indirect cost = 60RS/Day
i)   Draw the activity network of project.
ii) Find the critical path and duration.
iii) What is the normal duration and cost of project.
iv) Find out optimum duration and minimum project cost.

7. a) What is the necessity of maintaining inventory? What are the causes of poor inventory control? **8**

b) Explain ABC Analysis related to selective inventory management techniques. **8**

OR

8. **a)** A company has a demand of 12,000 units/year for an item and it can produce 2,000 such items per month. The cost of one setup is Rs. 400 and the holding cost/unit/month is Rs. 0.15. Find **8**
  1) Optimum lot size
  2) Total cost per year, assuming the cost of 1 unit as Rs. 4.
  3) Maximum inventory
  4) Manufacturing time.

b) A particular item has a demand of 9,000 units/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 **8**
  i) The economic lot size,
  ii) The number of orders per year,
  iii) The time between orders,
  iv) The total cost per year if the cost of one unit is Rs. 1.

9. **a)** Explain in Context to Decision Theory **6**
  a) Minimax Regret Criterion   b) Hurwicz Criterion

b) A manufacturing company processes 6 different jobs on two machines A and B Numbers of units of each job and its processing times on A and B are given in given table. Find the optimal sequence, the total minimum elapsed time and idle time for each machine. **10**

Job No.	No. of units of each job	Processing time	
		Machine A (minutes)	Machine B (minutes)
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

OR

10. **a)** Explain in detail situation under which sequencing problems are classified. **6**

b) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are given as: **10**

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time T.

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