Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, June 2021

Course: Operations Research **Semester: II**
Program: MBA BA/DB **Time: 03 Hours**
Course code: DSQT 7002 **Max. Marks: 100**

SECTION A

	Attempt all Questions	**Marks**	**CO**
	Select the most appropriate answer.	**6 X 5=30**	**CO_1**
1.	Dual of the dual problem of LPP is (a) Dual Problem (b) Primal Problem (c) Not possible to find (d) None of these		
2.	While solving the given LPP numerically which method is suitable ? Maximize $Z = 15x_1 + 20x_2$, subject to $x_1 + 2x_2 \geq 10$ $2x_1 - 3x_2 \leq 6$ $x_1 + x_2 \geq 6$ and $x_1 \geq 0, \quad x_2 \geq 0.$ (a) Two Phase Method (b) Big M method (c) Both can be applied (d) Simple simplex method		
3.	The following statement applies to both transportation model and assignment model (a) The inequalities of both problems are related to one type of resource. (b) Both use VAM for getting basic feasible solution (c) Both are tested by MODI method for optimality (d) Both have objective function, structural constraint and non-negativity constraints.		

4.	Consider a modified form of a matching biased problem game problem. The matching player is paid Rs. 8 if the two coins turn both heads and Rs. 1 if the coins turn both tails. The non-matching player is paid Rs. 3 when two coins do not match. Is saddle point exists in this game? (Give your answer YES or NO)		
5.	Linear programming is a (a) Constrained optimization technique (b) Technique for economic allocation of limited resources (c) Mathematical technique (d) All of the above		
6.	If r is the % rate then the discount factor of finding the net present value (NPV) of the second year maintenance amount equals (a) $1/r$ (b) $1/r^2$ (c) $1/(1+r)$ (d) $1/(1+r)^2$		

SECTION B

Q	**Attempt all the questions**	**10X 5=50**	
1.	(a) Explain with a suitable example how operations research techniques useful for decision making. (b) Explain the meaning of Basic feasible solution and optimum solution		**CO_2**
2.	A fleet owner finds form his past records that the cost per year of running a vehicle whose purchase price is Rs. 50000/- are as under: Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 Running Cost | 5000 | 6000 | 7000 | 9000 | 21500 | 18000 | 18000 Resale Value | 30000 | 15000 | 7500 | 3750 | 2000 | 2000 | 2000 Thereafter running cost increases by Rs.2000/- per year but resale value remains constant at Rs. 2000/-. At what stage the replacement is due?		**CO_2**
3.	Determine the transportation cost of the following problem using VAM method. **Destination** **Source** | | **E** | **F** | **G** | **H** | **Supply** | | **A** | 3 | 1 | 7 | 4 | **300** | | **B** | 2 | 6 | 5 | 9 | **400** | | **C** | 8 | 3 | 3 | 2 | **500** | | **Demand** | **250** | **350** | **400** | **200** | **1200** |		**CO_3**

OR

There are four jobs to be assigned to five machines. Only one job can be assigned to one machine. The amount of time in hours required for the jobs per machine are given in the following matrix :

Employees

Jobs	**I**	**II**	**III**	**IV**	**V**
A	4	3	6	2	7
B	10	12	11	14	16
C	4	3	2	1	5
D	8	7	6	9	6

Find an optimum assignment of jobs to the machines to minimize the total processing time and also find out for which machine no job is assigned. What is the total processing time to complete all the jobs?

4. Solve the following game :

		Player B					
Player *A*		**b_1**	**b_2**	**b_3**	**b_4**	**b_5**	**b_6**
	a_1	4	2	0	2	1	1
	a_2	4	3	1	3	2	2
	a_3	4	3	7	-5	1	2
	a_4	4	3	4	-1	2	2
	a_5	4	3	3	-2	2	2

CO_3

5. The details of material stocked in a company are given below with the unit cost and the annual consumption in Rs. Classify the material in to *A* class, *B* class and *C* class by *ABC* analysis.

CO_3

S.no.	Item Code	Annual Consumption	Unit Price in paisa
1	501	30,000	10
2	502	2,80,000	15
3	503	3,000	10
4	504	1,10,000	5
5	505	4,000	5
6	506	2,20,000	10
7	507	15,000	5
8	508	80,000	5
9	509	60,000	15
10	510	8,000	10

OR

The occurrence of rail in Dehradun on a day is dependent upon whether or not it rained on the previous day. If it rained on the previous day, the rain distribution is

Event	No rain	1 cm rain	2 cm rain	3 cm rain	4 cm rain	5 cm rain
Probability	0.50	0.25	0.15	0.05	0.03	0.02

If it did not rain on the previous day, the rain distribution is:

Event	No rain	1 cm rain	2 cm rain	3 cm rain
Probability	0.75	0.15	0.06	0.04

Simulate the Dehradun's weather for 10 days and determine by simulation the total days without rain as well as the total rainfall during the period, use the following random numbers for simulation

67, 63, 49, 55, 28, 78, 70, 06, 78, 76. Assume that for the first day of the simulation it had not rained day before.

SECTION-C

Q	**Attempt the question :**	**20 X 1 =20**	**CO_4**
1.	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 Linear Programming Models (Resource Allocation Models) 29 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. Formulate the problem and solve the by using graphical method to find the optimal product mix.

Machines	***Products Time required in hours)***		***Available capacity in hours***
	X	Y	
A	1	1	4
B	3	8	24
C	10	7	35
Profit Per Unit in Rs.	5	7	

Mention the assumptions & Characteristics of graphical method of solution.