

- a) Define operations research.
- b) List the phases involved in the Operation Research project.
- c) Define competitive game.
- d) Define simulation.
- e) Enumerate the assumptions of goal programming.
- f) What is a queue? Enumerate some applications of queuing theory.
- g) Why do industries need to carry inventory?
- h) How inventory control models can be classified?
- i) State the principle of optimality in dynamic programming.
- j) Explain the applications of individual replacement policy.

SECTION-B

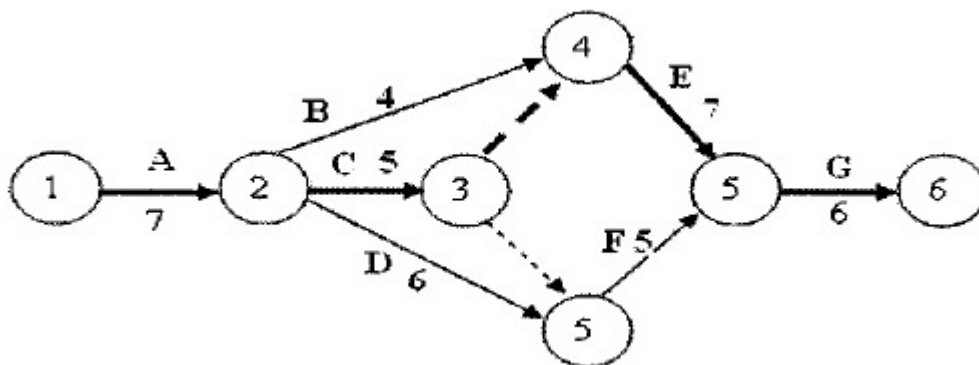
2. The manager of an oil refinery wants to decide on the optimal mix of two possible blending processes 1 and 2 of which the inputs and outputs per production runs are as follows. The maximum amounts available of crude A and B are 200 units and 150 units respectively. At least 100 units of gasoline X and 80 units of Y are required. The profit per production run from process 1 and 2 are Rs 300/- and Rs. 400/- respectively. Formulate the above as LP problem.

Input (Units)			Output (Units)	
Process	Crude A	Crude B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

3. Solve the following game by reducing it to 2×2 size by using graphical method.

0	4	-8	-5	1
1	5	8	-4	0

4. In a service facility, the average arrival rate is 5 per hour, and the average service rate is 6 per hour. Find the average number of customers in the queue and the entire queuing system. Also find the average waiting period of a customer in the queue and in the entire queuing system. What is the probability of there being 8 customers in the Q-system? Assume Poisson distribution for both arrival and service time.
5. Explain briefly deterministic and probabilistic dynamic programming.
6. Using the information shown in the network below, find the critical path and total duration of the project. Compute early and late starts & finish time for various activities. Also determine total float, independent float & free float for the activities.



Network showing Activity Names and Duration in Days

SECTION-C

7. a) Solve the following problem graphically :

$$\text{Maximize } Z = x_1 + 0.5 x_2$$

$$\text{subject to : } 3x_1 + 2x_2 \leq 12, 5x_1 \leq 10, x_1 + x_2 \leq 8, -x_1 + x_2 \geq 4$$

$$\text{where } x_1, x_2 \geq 0$$

- b) A company needs 6000 units of a product per month. The product is purchased from outside for which the set-up cost is Rs 2000 per order. The cost of holding inventory, in terms of capital tied up amounts to Rs 1.50 per unit per month. How frequently should the company place orders for the product?

8. a) Solve the following LP problem.

$$\text{Maximize: } z = 5x_1 + 2x_2$$

$$\text{Subject to: } 6x_1 + x_2 \geq 6, 4x_1 + 3x_2 \geq 12, x_1 + 2x_2 \geq 4$$

$$\text{where } x_1, x_2 \geq 0$$

- b) The purchase price of a machine is Rs. 52000/-. The installation charges amount to Rs. 14400/- and its scrap value is Rs. 6400/-. The maintenance cost in various years is given below :

Year :	1	2	3	4	5	6	7	8
Maintenance Cost :	1000	3000	4000	6000	8400	11600	16000	19200

After how many years, the machine should be replaced? Assume that the machine replacement can only be done at the year ends.

9. A bakery shop keeps stock of a popular brand of cake. Daily demand based on past experience is given below :

Daily demand	0	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Consider the following sequence of random numbers: 48, 78, 09, 51, 56, 77, 15, 14, 68 and 09.

- a) Using the sequence, simulate the demand for the next ten days
- b) Find the stock situation of the owner of the bakery decides to make 35 cakes every day. Also estimate the daily average demand for the cakes on the basis of the simulated data.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.