(03 Hours)   Total Marks: 80

N.B.: (1) Question No. 1 is **compulsory**.
      (2) Attempt any **THREE** questions out of remaining **FIVE** questions.
      (3) Assume suitable data wherever necessary.

1. Explain the following terms. (Any Four)   **20**
   a. Project management.
   b. Sensitivity analysis.
   c. Simulation models.
   d. Group replacement.
   e. Solve the following game

		Player B			
		I	II	III	IV
Player A	I	4	1	2	5
	II	7	8	5	9
	III	2	0	4	3

2. a. Solve the L.P. problem by using Simplex method   **10**
   Maximize $Z = 10x_1 + 6x_2 + 4x_3$
   Subjected to $x_1 + x_2 + x_3 \leq 100$,
                  $10x_1 + 4x_2 + 5x_3 \leq 600$,
                  $2x_1 + 2x_2 + 6x_3 \leq 300$,
                  $x_1, x_2, x_3 \geq 0$

   b. Solve the following game by using the principle of dominance.   **10**

		Player B					
		I	II	III	IV	V	VI
Player A	I	4	2	0	2	1	1
	II	4	3	1	3	2	2
	III	4	3	7	-5	1	2
	IV	4	3	4	-1	2	2
	V	4	3	3	-2	2	2

3. a. Solve the following assignment problem (Profits in 1000 Rs.)   **10**

	Machines				
Jobs	M_1	M_2	M_3	M_4	M_5
J_1	12	14	13	14	15
J_2	14	13	12	----	17
J_3	18	16	15	13	17
J_4	10	10	----	16	12
J_5	16	15	14	22	13

   b. A self service store employs one cashier at its counter. Nine customers arrive on   **10**
   an average every 5 minutes while the cashier can serve 10 customers in 5
   minutes. Assuming Poisson distribution for arrival rate and exponential
   distribution for service time.
   Find: i) Average number of customers in the system
         ii) Average number of customers in the queue
         iii) Average time a customer spends in system
         iv) Average time a customer waits before being served.

[TURN OVER

4. a. A machine operator has to perform two operations turning and threading on a   10
number of different jobs. The time required to perform these operations (in
minutes) for each job is known. Determine the order in which the jobs should be
processed in order to minimize the total time required to turn out all the jobs.
Also determine the total processing time and idle times for turning and threading
operations.

Job	1	2	3	4	5	6
Turning (min)	3	12	5	2	9	11
Threading (min)	8	10	9	6	3	1

b. A bakery keeps stock of a popular brand of cake. Daily demand based on past   10
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
(i) Using the sequence, simulate the demand for the next 10 days
(ii) Find the stock situation if 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.

5. a. Explain in detail the method of solving the L.P. problem by Two phase method.   10

b. Find the basic feasible solution of the following transportation problem by VAM.   10
Find the optimal solution using MODI method.

		Distribution centres				
		1	2	3	4	Supply
Plants	1	2	3	11	7	6
	2	1	0	6	1	1
	3	5	8	15	9	10
Requirement		7	5	3	2	

6. a. Consider the following data of a project.

Activity	Duration (Days)		
	t_o	t_m	t_p
1-2	6	9	18
1-3	5	8	17
2-4	4	7	22
3-4	4	7	16
4-5	4	10	22
2-5	4	7	10
3-5	2	5	8

(i) Construct the project network and find the project duration.
(ii) Find variance of each activity.
(iii) Find the critical path.
(iv) What is the probability of completing the project in 32 days?

b. What is dynamic programming and what sort of problems can be solved by it?   07
State Bellman's principle of optimality and why it holds.