B.E. (IT) (Sem - VII) (CB)   Date - 26/11/19

3 Hours

Total: 80 marks

N.B: (1) Question no 1 is compulsory
(2) Attempt any **three** out of remaining **five** questions
(3) Figures to the right indicate full marks
(4) Assume Suitable data if necessary
(5) Notations carry usual meaning

Q.1   Answer **any four** of the following questions:

a) Write the dual of the following LPP
Maximise Z= $4x_1 + 2x_2$
Subject to ,
$x_1 - 2x_2 \geq 2$
$x_1 + 2x_2 = 8$
$x_1 - x_2 \leq 10$
Where $x_1 \geq 0, x_2$ is unrestricted in sign.   **(05)**
b) What are assumptions made in game theory   **(05)**
c) Write short note on special cases in Linear Programming Problem.   **(05)**
d) Enlist assumptions in sequencing problem.   **(05)**
e) Briefly explain Monte Carlo simulation with suitable example.   **(05)**

Q.2   a) Solve by Simplex Method:

Maximize $Z=3x_1 + 2x_2$
Subject to
$x_1 + x_2 \leq 4$,
$x_1 - x_2 \leq 2$
Where $x_1, x_2 \geq 0$

(10)

b) Workers come to tool store room to receive special tools (required by them) for accomplishing a particular project assigned to them. The average time between two arrivals is 60 seconds and the arrivals are assumed to be in Poisson distribution. The average service time (of tool room attendant) is 40 seconds. Determine
1) Average queue length
2) Average length of non empty queue
3) Average number of workers in system
4) Mean waiting time of an arrival
5) Average waiting time of an arrival (worker) who waits.

(10)

Q.3   a) Solve the following by Vogel's Approximation Method (VAM) and find optimal transportation plan.

(10)

	D₁	D₂	D₃	D₄	Supply
S₁	19	30	50	10	7
S₂	70	30	40	60	9
S₃	40	8	70	20	18
Demand	5	8	7	14	

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b) Iyengar Bakery keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given here: **(10)**

Daily Demand	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Consider the following sequence of random numbers:
48,78,19,51,56,77,15,14,68,09

Using this sequence simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decided to make 30 cakes every day. Also estimate the daily average demand for this cake on the basis of simulated data.

Q.4   a) Solve the following Assignment Problem.   **(10)**

Contractors	Cost of Repairs (Rs.in Lakhs) of Roads			
	R_1	R_2	R_3	R_4
C_1	9	14	19	15
C_2	9	17	20	19
C_3	9	18	21	18
C_4	10	12	18	19
C_5	10	15	21	16

Rs.50 Lakhs is total cost of repair.
1) Find the best way of assigning the repair work to the contractors and cost.
2) If it is necessary to seek supplementary grants, then what should be the amount?
3) Which of the 5 contractors will be unsuccessful in his bid?

b) A distance network consists of eleven nodes which are distributed as shown in following table. Find the shortest path from node 1 to node 11 using dynamic programming. The corresponding distance are: **(10)**

Arc	Distance	Arc	Distance
1-2	8	5-8	12
1-3	7	5-9	7
1-4	1	6-9	9
2-5	5	7-9	6
3-5	9	7-10	13
3-6	2	8-11	4
3-7	8	9-11	2
4-7	10	10-11	15

Q.5 a) A and B play a game in which each has three coins a 5p,a 10p and 20p.Each player selects a coin without the knowledge of the others choice. If the sum of the coin is an odd amount, A wins B's coin; if the sum is even, B wins A's coin. Find the best strategy for each player and the value of the game. **(10)**

b)Solve by **Big-M or Charne's Penalty Method** **(10)**

Maximize $Z=4x_1 + x_2$
Subject to $3x_1 + x_2 = 3$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 4$$
Where $x_1, x_2 \geq 0$

Q.6 a) A book binder has one printing press, one binding machine and the manuscript of number of different books. The time required to perform the printing and binding operation for each book are given below. Determine the order in which book should be processed, in order to minimise the total time required to turn out all the books. Also find the idle time of binding machine. **(10)**

Books	1	2	3	4	5	6
Printing time (hr)	30	120	50	20	90	110
Binding time (hr)	80	100	90	60	30	10

b) Mini Computer Company purchases a component of which it has a steady usage of 1000 units per year. The ordering cost is Rs.50 per order. The estimated cost of money invested is 25% per year. The unit cost of the component is Rs.40.Calculate the optimal ordering policy and total cost of inventory system, including purchase cost of the components. If the component supplier agrees to offer price discounts of minimum lot supplies as per schedule given below, reassess the decision on optimal ordering policy and total cost. **(10)**

Lot size	Price
Upto 149	Rs.40
150-499	Rs.39
500 or More	Rs.38

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