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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**

Branch: Industrial Engineering & Management **Duration: 3 hrs.**

Course Code: 22IM6PCADM **Max Marks: 100**

Course: Advanced Decision Modelling

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of statistical tables permitted.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Solve the following LPP using two phase method *MAX Z = 5x1 + 8x2* *subject to* *3x1 + 2x2 >= 3* *x1 + 4x2 >= 4* *x1 + x2 <= 5* *and x1,x2 >= 0*	*CO2*	*PO2*	**10**
	b)	Solve the following LPP by Revised simplex method. MAX Z = 3x1 + 5x2 subject to x1 <= 4 x2 <= 6 3x1 + 2x2 <= 18 and x1,x2 >= 0	*CO2*	*PO2*	**10**
		OR			
2	a)	Solve the following IPP Max $Z = x_1 + x_2$ subject to $3x_1 + 2x_2 \leq 5$ $x_2 \leq 2$ and $x_1, x_2 \geq 0$; x_1, x_2 non-negative integers	*CO2*	*PO2*	**10**
	b)	A travelling salesman has to visit five cities. He wishes to start from a particular city, visit each city only once and then return to his starting point. The travelling cost of each city from a particular city is given below. A: M, 3.5, 3, 4, 2 B: 3.5, M, 4, 2.5, 3	*CO3*	*PO2*	**10**

			C	3	4	M	4.5	3.5	
			D	4	2.5	4.5	M	4	
			E	2	3	3.5	4	M	
			How should the jobs be allocated, one per employee, so as to minimize the total man-hours using branch and bound technique?						
			UNIT-II						
	3	a)	In an airport, Passengers has to go through 3 phases for boarding the plane, first they have to collect the boarding pass from the ticket counter, after that they have to go to security check and in last phase would be showing the boarding pass with security seal to Airhostess. The passengers arrive at a Poisson fashion with arrival time of 10 minutes. The time spent by passengers to get their service done follows an exponential distribution with mean of 6 minutes. Determine: (i) The average waiting time of passengers in the airport? (ii) Number of passengers waiting in the queue?	*CO3*	*PO2*	**10**
		b)	A tax-consulting firm has 3 counters in its office to receive people who have problems concerning their income, wealth and sales taxes. On the average 48 persons arrive in an 8- hour day. Each tax adviser spends 15 minutes on the average on an arrival. If the arrivals are Poisson distributed and service times are according to exponential distribution find: (a) The average number of customers in the system, (b) Average number of customers waiting to be serviced, (c) Average time a customer spends in the system (d) The number of hours each week a tax adviser spends performing his job (e) The expected number of idle tax advisers at any specified time.	*CO3*	*PO2*	**10**
			OR						
	4	a)	Class teacher evaluates students on a monthly basis. Students are rated as Poor, Good and Excellent depending on academic's history. The following matrix of transition probabilities reflect the probabilities that a student's secured marks in one month will be evaluated in a given category on the following month. $P = \begin{matrix} Poor \\ Good \\ Excellent \end{matrix} \begin{bmatrix} 0.80 & 0.18 & 0.02 \\ 0.2 & 0.75 & 0.05 \\ 0 & 0.16 & 0.84 \end{bmatrix}$ Given an instating pool of 100 students, in the long run how many students will be classified in each category? Also draw transition diagram for the matrix	*CO3*	*PO2*	**10**
		b)	A Professor has three pet questions, one of which appears in every question paper he sets. The students know his habit well, the professor never uses the same question twice in a row. If he sets question one in previous paper, he tosses a coin and uses question two if a head comes out. If he has used question two in the previous paper, he tosses two coins and switches to question three if both coins show heads. If he has used question three, then he tosses three coins and switches to question one if all the three coins come up	*CO3*	*PO2*	**10**

		with heads. i) Construct the transition matrix ii) Construct the transition diagram iii) In the long run which question does he included most often and with how much frequency it is used?			
		UNIT-III			
5	a)	Define the term simulation? Enumerate the reasons for its importance in decision making	*CO1*	*PO1*	**04**
	b)	Discuss Mid-square technique for generating pseudo random numbers	*CO1*	*PO1*	**04**
	c)	Use Linear Congruential Method to generate a sequence of five two-digit random integers. Take Xo = 27, a= 8, C = 47 and m =100. Validate the results generated follows a Uniform distribution, with level of significance = 10%.	*CO4*	*PO3*	**12**
		OR			
6	a)	List the necessary criteria to be considered for generating pseudo random numbers	*CO1*	*PO1*	**04**
	b)	Generate 6 random numbers using multiplicative congruential method with X0 = 100, a = 45, and m = 1000.	*CO2*	*PO2*	**06**
	c)	Test whether the 1st, *6th*, *11th*, and so on, for the 30 numbers are auto-correlated or not. With level of significance = 10%.	*CO2*	*PO2*	**10**

0.12	0.01	0.23	0.28	0.89	0.31	0.64	0.28	0.83	0.93
0.99	0.15	0.33	0.35	0.91	0.41	0.60	0.27	0.75	0.88
0.68	0.49	0.05	0.43	0.95	0.58	0.19	0.36	0.69	0.87

		UNIT-IV			
7	a)	With usual notations derive random variate generator for Uniform distribution. Also generate 4 values of X considering Minimum value = 1 and Maximum value = 7 with random numbers of 0.52, 0.89, 0.08, 0.78	*CO2*	*PO2*	**12**
	b)	Explain the necessary steps in developing input data model for simulation	*CO1*	*PO1*	**08**
		OR			
8	a)	With a neat diagram Explain Box – Muller concept for direct transformation	*CO2*	*PO1*	**06**
	b)	Records pertaining to the weekly number of thefts at a super mall were being studied by a detective agency. The values for the past 100 weeks were as follows:	*CO2*	*PO1*	**14**

Theft / Week	0	1	2	3	4	5	6
Occurrence Frequency	35	40	13	6	4	1	1

Apply chai-square test to these data to test the hypothesis that the underlying distribution is Poisson. Assume level of significance of 10%

			UNIT-V			
	9	a)	With suitable example, explain the necessary steps followed in solving Analytical Hierarchical Process	*CO4*	*PO2*	**10**
		b)	Explain the need of MCDM and soft computing tools in current decision-making scenario.	*CO4*	*PO3*	**10**
			OR			
	10	a)	With suitable example, explain the necessary steps followed in solving Analytical Hierarchical Process	*CO4*	*PO2*	**10**
		b)	Explain the following: (i) Genetic Algorithm (ii) Neural Network	*CO4*	*PO1*	**10**

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