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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

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

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

Course Code: 23IM6PCADM /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.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Summarize the two-phase simplex method of solving LPP.	CO1	PO1	**06**
	b)	Using Revised Simplex Method: Max $Z = x_1 + 2x_2$ Subject to $x_1 + x_2 \leq 3$ $x_1 + 2x_2 \leq 5$ $3x_1 + x_2 \leq 6$ and $x_1, x_2 \geq 0$	CO1	PO1	**14**
		OR			
2	a)	What is integer programming? How does integer programming differ from linear programming? How to formulate integer programming models?	CO1	PO1	**06**
	b)	What is branch and bound technique? How do branching and bounding work? Discuss the implementation of branching and bounding using general algorithm.	CO1	PO1	**14**
		UNIT - II			
3	a)	What is queuing theory? Explain Kendall's notation for representing queuing models.	CO2	PO2	**06**
	b)	On an average 96 patients per 24-hours day require the service of an emergency clinic. Also on the average a patient requires 10 minute of active attention. Assume that the facility can handle only one emergency at a time suppose that it costs the clinic Rs.100 per patient treated to obtain an average servicing time of 10 minute, and that each minute of decrease in this average time would cost the clinic Rs.10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from $1\frac{1}{3}$ patient to $\frac{1}{2}$ patient?	CO2	PO2	**14**
		OR			
4	a)	In the context of Markov Chains, define the following terms: 1. Stochastic process 2. Ergodic Markov chain 3. Transition Matrix	CO2	PO2	**06**

		b)	i. State the Chapman-Kolmogorov equation in the context of Markov chains. Explain its significance in calculating multi-step transition probabilities. ii. Consider the Markov chain with three states, S={1,2,3}, that has the following transition matrix: $P=\begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{3} & 0 & \frac{2}{3} \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$ a. Draw the state transition diagram for this chain. b. If $P(X_1=1) = P(X_1=2) = {}^1/_4$ find $P(X_1=3, X_2=2, X_3=1)$	*CO2*	*PO2*	**14**
			UNIT - III			
	5	a)	Explain the steps involved in a simulation study with a flow diagram.	*CO3*	*PO2*	**10**
		b)	Name the entities, attributes, activities, events, and state variables for the following system: a. Cafeteria b. Inventory c. Banking d. A hospital emergency room e. Communication	*CO3*	*PO2*	**10**
			OR			
	6	a)	Discuss the importance of random numbers in simulation modeling. Why are algorithmically generated random numbers not considered truly random? List and briefly explain potential issues that may arise when using such pseudo-random numbers in simulations.	*CO3*	*PO2*	**10**
		b)	The following five random numbers were generated: 0.44, 0.81, 0.14, 0.05, and 0.93 Using the Kolmogorov-Smirnov test, determine whether these numbers follow a uniform distribution, at a 5% level of significance.	*CO3*	*PO2*	**10**
			UNIT - IV			
	7	a)	What is an Empirical Continuous Distribution? How to Use Empirical Distributions in Simulation? Elaborate with an example.	*CO4*	*PO3*	**10**
		b)	Enumerate the procedure for generating random variates from an Exponential Distribution using the Inverse Transform Method. Corresponding to the two random numbers 0.432 and 0.87, generate two random variates of Triangular distribution with minimum -2, mode 0 and maximum 2.	*CO4*	*PO3*	**10**
			OR			

	8	a)	List the key steps involved in developing a useful model of input data for simulation purposes. Discuss the procedure for constructing a histogram from observed data. How can a histogram be used to identify a suitable probability distribution in simulation modeling?	*CO4*	*PO3*	**10**
		b)	What do you mean by Goodness of fit? Explain how input models can be selected for a simulation when data is not available.	*CO4*	*PO3*	**10**
			UNIT - V			
	9	a)	Multi-Criteria Decision Making (MCDM) is a powerful framework that enables decision-makers to evaluate alternatives against multiple criteria." Justify this statement by highlighting the diverse applications of MCDM.	*CO5*	*PO3*	**10**
		b)	Outline the steps involved in solving a decision-making problem using the Analytic Hierarchy Process (AHP).	*CO5*	*PO3*	**10**
			OR			
	10	a)	What is soft computing? How does it differ from conventional (hard) computing? Give an overview of a few soft computing methods.	*CO5*	*PO2*	**10**
		b)	Explain the following basic terms as used in Artificial Neural Networks and Fuzzy Logic: 1. Neuron 2. Activation Function 3. Weight 4. Membership Function 5. Rule Base	*CO5*	*PO1*	**10**

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