U.S.N.										

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

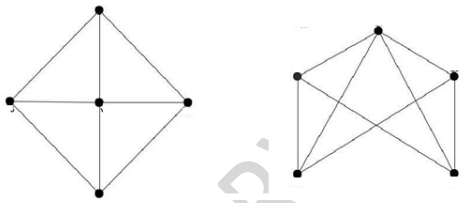
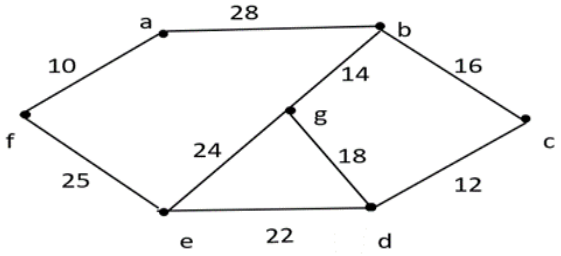
Autonomous Institute Affiliated to VTU

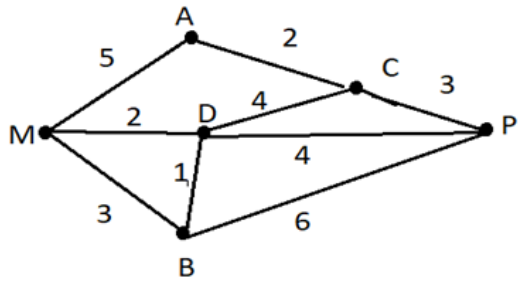
October 2024 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: CSE/ISE/CS-IOT/AI-DS/CS-DS **Duration: 3 hrs.**
Course Code: 23MA3BSSDM **Max Marks: 100**
Course: Statistics and Discrete Mathematics

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 table is permitted.

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 - 1	CO	PO	Marks
1	a)	Verify whether following graphs are isomorphic or not. 	CO1	PO1	**06**
	b)	Apply Kruskal's algorithm to find a minimal spanning tree for the following weighted graph and also find its weight. 	CO1	PO1	**07**
	c)	Let G be a simple graph with n vertices and m edges, where m is at least 3. If $m \geq \frac{(n-1)(n-2)}{2}+2$, then prove that G is Hamiltonian graph.	CO1	PO1	**07**
		OR			
2	a)	Determine the order $\lvert V \rvert$ of the graph $G=(V,E)$ in the following cases: (i) G is cubic graph with 15 edges. (ii) G is k-regular with 3 edges. (iii) G has 8 edges with 4 vertices of degree 3 and all other vertices of degree 4.	CO1	PO1	**06**

		b)	For the given incidence matrix $A(G)$, construct the graph G and also write the adjacency matrix of G. $A(G) = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 \end{bmatrix}$	*CO1*	*PO1*	**07**
		c)	Consider the map below. The cities are marked as M, A, B, C, D and P and every edge has a cost associated with it. We need to travel from Mumbai (M) to Pune (P). Apply Dijkstra's algorithm to find the shortest path and the minimum cost from Mumbai to all other cities. 	*CO1*	*PO1*	**07**
			UNIT - 2			
	3	a)	An old lawn mower has a 20% chance of starting on a particular pull. Find the probability that it takes (i) exactly 3 pulls to start the mower (ii) 10 or fewer pulls to start the mower	*CO1*	*PO1*	**06**
		b)	Steel rods are manufactured to be 3 cms in diameter but they are acceptable if they are inside the limits 2.299cms and 3.01 cms. It is observed that 5% are rejected as oversized and 5% are rejected as undersized. Assuming that the diameters are normally distributed, find the standard deviation of the distribution.	*CO1*	*PO1*	**07**
		c)	The number of road accidents per day in a certain city is distributed as a gamma variate with an average of 6 and variance 18. Find the probability that there will be (i) more than 8 accidents (ii) between 5 and 8 accidents, on a particular day.	*CO1*	*PO1*	**07**
			UNIT - 3			
	4	a)	Find the constant c so that $P(x,y) = \begin{cases} c(2x+y) & 0 \le x \le 2, 0 \le y \le 3 \\ 0 & \text{otherwise} \end{cases}$ is a joint probability density function of x and y. Then evaluate $P(x \ge 1, y \le 2)$.	*CO1*	*PO1*	**06**
		b)	Two fruits are selected at random from a bag containing 3 Apples, 2 Oranges and 4 Mangoes. If X and Y are respectively, the number of Oranges and the number of Mangoes included among the two fruits drawn from the bag, find the probability associated with all possible pair of values (x, y). Also find the covariance between the variables X and Y.	*CO1*	*PO1*	**07**

	c)	A petrol station owner is considering the effect on his business (Superpet) of a new petrol station (Global) which has opened just down the road. Currently (of the total market shared between Superpet and Global) Superpet has 80% of the market and Global has 20%. Analysis over the last week has indicated the following probabilities for customers switching the station they stop at each week: $\begin{bmatrix} 0.75 & 0.25 \\ 0.55 & 0.45 \end{bmatrix}$ (i) What will be the expected market share for Superpet and Global after another two weeks have past? (ii) What would be the long-run prediction for the expected market share for Superpet and Global?	*CO1*	*PO1*	**07**
		UNIT - 4			
5	a)	Two random samples of sizes 9 and 7 gave the sum of squares of deviations from their respective means as 175 and 95 respectively. At 5% level of significance can they be regarded as drawn from the normal populations with the same variance?	*CO1*	*PO1*	**06**
	b)	In a certain experiment to compare two types of pig foods *A* and *B* the following results of an increase in weights were observed in pigs. Pig number | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 Increase in weight in kg | Food *A* | 49 | 53 | 51 | 52 | 47 | 50 | 52 | 53 Increase in weight in kg | Food *B* | 52 | 55 | 52 | 53 | 50 | 54 | 54 | 53 Assuming that the two samples of pigs are independent can we conclude that food *B* is better than food *A* concerning the difference in their means at a 5% level of significance?	*CO1*	*PO1*	**07**
	c)	120 digits were chosen at random from a set table. The frequencies of the digits are shown below. Digits | 1 | 2 | 3 | 4 | 5 | 6 Frequency | 30 | 25 | 18 | 10 | 22 | 15 Fit a Poisson distribution to the data and test the goodness of fit at 5% level of significance.	*CO1*	*PO1*	**07**
		OR			
6	a)	The mean life of electronic equipment is 600 days with a standard deviation of 120 days. The manufacturer installs new machines to improve the quality of production and claims that the new process has increased the mean life of the equipment. To test his claim, a sample of 100 items is chosen and it is found that the mean life has increased to 625 days. Can we accept the claim at 5% level of significance?	*CO1*	*PO1*	**06**

	b)	A training program was conducted to improve participants knowledge on ICT. Data were collected from a selected sample before and after the ICT training program. Pre: 12, 14, 13, 11, 12, 10, 15, 13, 9, 14 Post: 13, 15, 13, 12, 13, 11, 16, 13, 8, 14 Test the hypothesis the training is effective in improving participants knowledge on ICT at a 5% level of significance.	*CO1*	*PO1*	**07**
	c)	The mean height of 80 boys who participated in the athletic competition in a college was 167 cm with standard deviation 9 cm. The mean height of the remaining 160 boys who did not participate in the competition was 163cm with standard deviation 10 cm. Test the hypothesis at 1% level of significance, whether the students who participated in athletics are taller than the other students.	*CO1*	*PO1*	**07**
		UNIT - 5			
7	a)	Define Catalan number. Obtain the number of paths from (7,3) to (10,6) and not rise above the line $y = x - 4$.	*CO1*	*PO1*	**06**
	b)	Determine the number of integers between 1 and 300 (both inclusive) which are divisible by none of 5, 6, 8?	*CO1*	*PO1*	**07**
	c)	Find the coefficient of (i) x^{12} in the expansion of $x^3(1-2x)^{10}$, (ii) $a^2b^3c^2d^5$ in the expansion of $(a+2b-3c+2d+5)^{16}$.	*CO1*	*PO1*	**07**

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