U.S.N.										

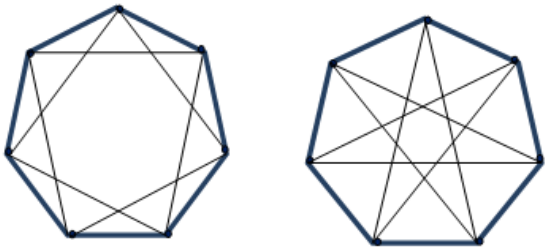
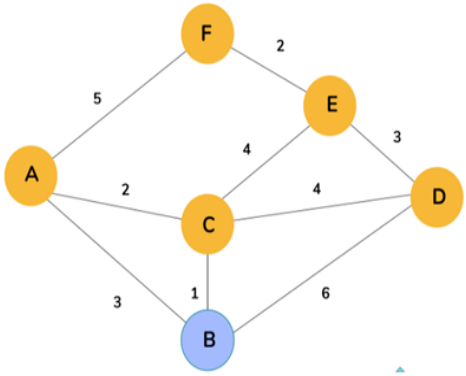
B.M.S. College of Engineering, Bengaluru-560019

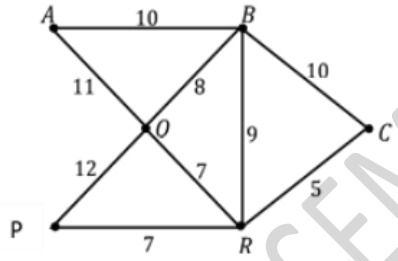
Autonomous Institute Affiliated to VTU

April 2024 Semester End Main 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.

		UNIT - 1	CO	PO	Marks
1	a)	Determine the order of the graph in the following cases. (i) G is a cubic graph with 15 edges. (ii) G has 10 edges with 2 vertices of degree 4 and all other vertices of degree 3. (iii) G is a regular graph with 9 edges.	CO1	PO1	**06**
	b)	Show that the following graphs are isomorphic. 	CO1	PO1	**07**
	c)	Consider the map below. The cities have been selected and marked from alphabets A to F and every edge has a cost associated with it. We need to travel from Bengaluru (Vertex B) to all other places. Apply Dijkstra's algorithm to find the shortest paths and distance from Bengaluru to other destinations. 	CO1	PO1	**07**
		OR			

	2	a)	Suppose a committee has seven members, these members meet each day for lunch at a round table. They decide to sit in such a way that every member has different neighbours at each lunch. Apply Graph theory to explain the distinct ways of seating arrangements and also list those arrangements.	*CO1*	*PO1*	**06**
		b)	Draw the graph G whose incidence matrix is given and hence obtain the adjacency matrix of the corresponding graph G $A(G) = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$.	*CO1*	*PO1*	**07**
		c)	Apply Kruskal's algorithm to find a minimal spanning tree for the weighted graph shown below and also find its weight. 	*CO1*	*PO1*	**07**
			UNIT - 2			
	3	a)	A practicing shooter scores 93% of his shots during a training session. (i) What are the chances that he would not miss a single shoot till his 20^{th} try? (ii) What is the expected number of shots taken before his first miss?	*CO1*	*PO1*	**06**
		b)	In a test on 2,000 electric bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2,040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for (i) More than 2150hours, (ii) Less than 1950 hours, (iii) More than 1920 hours but less than 2160 hours.	*CO1*	*PO1*	**07**
		c)	Suppose that the time (in hours) taken by a homeowner to mow his lawns is a random variable having a gamma distribution with parameters $\alpha = 2$ and $\beta = 2$. Find the probability that it takes (i) at most 1 hour (ii) at least 2 hours (iii) between 0.5 to 1.5 hours to mow the lawn.	*CO1*	*PO1*	**07**
			UNIT - 3			
	4	a)	The Joint probability distribution table for two random variables X & Y is as follows X \ Y: -2, -1, 4, 5 1: 0.1, 0.2, 0, 0.3 2: 0.2, 0.1, 0.1, 0 Find the marginal distributions of X and Y. Also, find $COV(X,Y)$.	*CO1*	*PO1*	**06**

		b)	A company produces cans of mixed nuts containing almonds, cashews, and peanuts. Each can is exactly 1 lb, but the amount of each type of nut is random. The joint probability density function $f(x,y)$ where X is the amount of almonds, and Y, the amount of cashews, is $f(x,y)=\begin{cases}24xy & 0\le x\le 1, 0\le y\le 1, x+y\le 1,\\ 0 & \text{otherwise}\end{cases}$ Show that the probability that there are more almonds than cashews is 0.50.	*CO1*	*PO1*	**07**
		c)	A student's study habits are as follows: If he studies one night, he is 60% sure not to study the next night; on the other hand if he does not study one night, he is 80% sure to study the next night. (i) Write the transition matrix of this Markov chain (ii) In the long run how often does he study?	*CO1*	*PO1*	**07**
			UNIT - 4			
	5	a)	If a random sample data shows that 42 men earn on the average 744.85 with standard deviation 397.7, while 32 women earn on the average 516.78 with standard deviation 162.523. Test at 0.05 level of significance whether the average income for men and women is same or not.	*CO1*	*PO1*	**06**
		b)	The horses A & B were tested according to the time (in seconds) to run a particular race with the following results: Horse A: 28, 30, 32, 33, 33, 29, 34 Horse B: 29, 30, 30, 24, 27, 29 At 1% level of significance, test whether you can discriminate between the two horses.	*CO1*	*PO1*	**07**
		c)	The following data relates to the number of mistakes in each page of a book containing 180 pages. No. of mistakes per page: 0, 1, 2, 3, 4, 5 or more No. of pages: 130, 32, 15, 2, 1, 0 Fit a Poisson distribution and test for its goodness at 5% level of significance.	*CO1*	*PO1*	**07**
			OR			
	6	a)	A certain stimulus administered to each of 12 patients resulted in the following increases of blood pressure: 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will in general be accompanied by an increase in blood pressure at 5% level of significance.	*CO1*	*PO1*	**06**
		b)	A sample of 900 members is found to have a mean 3.4. Can it be reasonably regarded as a truly random sample from a large population with mean 3.25cm and standard deviation 1.61cm at 5% level of significance.	*CO1*	*PO1*	**07**

	c)	Measurement on the length of a copper wire were taken in 2 experiments A and B as under: A's measurements (mm): 12.29, 12.25, 11.86, 12.13, 12.44, 12.78, 12.77, 11.90, 12.47 B's measurements (mm): 12.39, 12.46, 12.34, 12.22, 11.98, 12.46, 12.23, 12.06, -- At 1% level of significance, test whether B's measurements are more accurate than A's.	*CO1*	*PO1*	**07**
		UNIT - 5			
7	a)	For the positive integers $1,2,3,4,\ldots\ldots n$, there are 11660 derangements where $1, 2, 3, 4, 5$ appear in the first five positions. What is the value of $'n'$?	*CO1*	*PO1*	**06**
	b)	Determine the coefficient of (i) xyz^2 in the expansion of $(2x-y-z)^4$, (ii) $a^2b^3c^2d^5$ in the expansion of $(a+2b-3c+2d+5)^{16}$.	*CO1*	*PO1*	**07**
	c)	In how many ways 5 number of a's, 4 number of b's and 3 number of c's can be arranged so that all the identical letters are not in a single block?	*CO1*	*PO1*	**07**

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