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

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E.   Semester: III
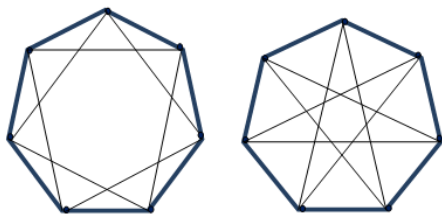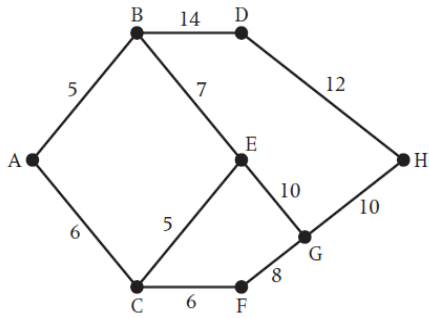Branch: CSE/ISE   Duration: 3 hrs.
Course Code: 19MA3BSSDM   Max Marks: 100
Course: Statistics and Discrete Mathematics

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)		Find the in-degrees and out-degrees of all the vertices for the following digraph and verify hand shaking property.	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 determine a minimal spanning tree for the following graph and also find its weight.	CO1	PO1	**07**
			OR			
2	a)		Determine the order of the graph in the following cases. (i) G is a cubic graph with 9 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 15 edges.	CO1	PO1	**06**

	b)	With proper labeling show that the following graphs are isomorphic.	CO1	PO1	**07**
	c)	Apply Dijkstra's algorithm on the network below to find the shortest path and distance from A to H.	CO1	PO1	**07**

<div align="center">UNIT – 2</div>

3	a)	Define Catalan number. Obtain the number of paths from $(3,8)$ to $(11,16)$ and not rise above the line $y=x+5$ using the moves $R: (x,y) \to (x+1,y)$ and $U: (x,y) \to (x,y+1)$.	CO2	PO1	**06**
	b)	Find the coefficient of $a^2 b^3 c^2 d^5$ in the expansion of $(a+2b-3c+2d+5)^{16}$.	CO2	PO1	**07**
	c)	Out of 30 students in a hospital, 15 study History, 8 study Economics and 6 study Geography. It is known that 3 students study all these subjects. Show that 7 or more students' study none of these subjects.	CO2	PO1	**07**

<div align="center">UNIT - 3</div>

4	a)	2% of the fuses manufactured by a firm are found to be defective. Apply Poisson distribution to find the probability that a box containing 200 fuses contains (i) no defective fuse (ii) 3 or more defective fuses.	CO3	PO1	**06**
	b)	In a certain town the duration of a shower is exponentially distributed with mean 5 minutes. What is the probability that a shower will last for (i) less than 10 minutes (ii) 10 minutes or more .	CO3	PO1	**07**
	c)	The joint probability distribution of two random variables X and Y is given below:	CO3	PO1	**07**

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 evaluate $Cov\,(X,Y)$.

		UNIT - 4			
5	a)	A random sample for 1000 workers in company has mean wage of Rs.50 per day and S.D of Rs.15. Another sample of 1500 workers from another company has mean wage of Rs. 45 per day and S.D of Rs.20. At 5% level of significance, does the mean rate of wages varies between the two companies?	CO3	PO1	**06**
	b)	Test the effectiveness of the leadership training for a group of 7 employees at 5% significance level. The score of the employee's performance before and after the training are given below.	CO3	PO1	**07**

Employee	1	2	3	4	5	6	7
Before	97	91	65	76	69	75	90
After	90	96	77	84	79	69	79

	c)	A sample analysis of examination results of 500 students was made. It was found that 220 students had failed, 170 had secured third class 90 had secured second class and 20 had secured first class. At 1% level of significance, do these figures support the general examination result which is in the ratio 4:3:2:1 for the respective categories?	CO3	PO1	**07**
		OR			
6	a)	Results extracts revealed that in a certain school over a period of five years 725 students had passed and 615 students had failed. Test the hypothesis that success and failure are in equal proportions.	CO3	PO1	**06**
	b)	Two random samples drawn from 2 normal populations are given below. Test whether the 2 populations have the same variance at 5% level of significance.	CO3	PO1	**07**

I	20	16	26	27	23	22	18	24	25	19		
II	17	23	32	25	22	24	28	6	31	33	20	27

	c)	Out of random sample of 9 mice, suffering with a disease, 5 mice were treated with a new serum while the remaining were not treated. From the time commencement of experiment, the following are the survival times:	CO3	PO1	**07**

Treatment	2.1	5.3	1.4	4.6	0.9
No Treatment	1.9	0.5	2.8	3.1	-

Test whether the serum treatment is effective in curing the disease at 5% L.O.S., assuming that the two populations are normally distributed with equal variances.

		UNIT - 5			
7	a)	Check whether the following matrix is regular stochastic matrix. $A = \begin{bmatrix} 0 & 0.75 & 0.25 \\ 0.5 & 0.5 & 0 \\ 0 & 1 & 0 \end{bmatrix}$	CO3	PO1	**06**

		b)	A student's study habits are as follows. If he studies one night, he is 70% sure not to study the next night. On the other hand if he does not study one night, he is 60% sure not to study the next night. (i) write the transition matrix for the given Markov chain. (ii) In the long run how often does he study?	CO3	PO1	**07**
		c)	At Bharat petrol pump, customers arrive according to a Poisson process with an average time of 5 minutes between arrivals. The service time is exponentially distributed with mean time as 2 minutes. On the basis of this information, find out (i) What would be the average number of customers in the queuing system? (ii) What would be the average queue length? (iii) What is the average time spent by a car in the petrol pump? (iv) What is the average waiting time of a car before receiving petrol?	CO3	PO1	**07**

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