U.S.N.										

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

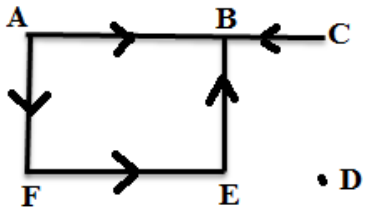
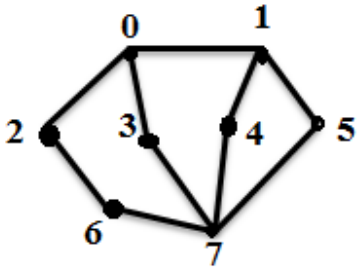
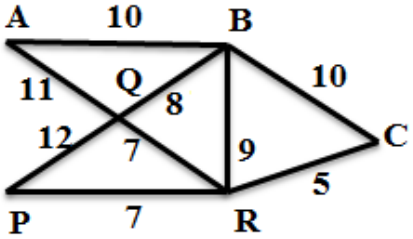
Autonomous Institute Affiliated to VTU

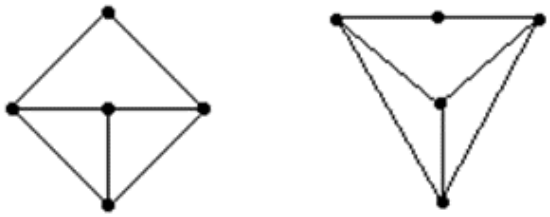
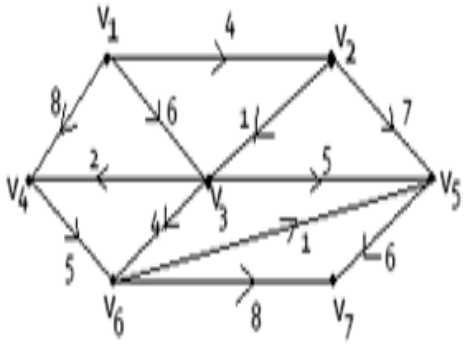
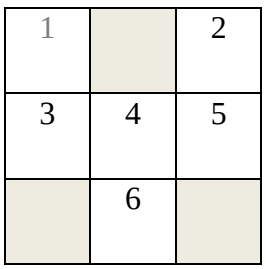
April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: CSE/ISE **Duration: 3 hrs.**
Course Code: 22MA3BSSDM **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)	Find the in-degree and the out-degree of the vertices of the digraph given below and verify hand shaking property. 	*CO1*	*PO1*	**06**
	b)	Find the adjacency matrix for the given graph below and also write any three observations. 	*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**
		OR			

	2	a)	Define graph isomorphism. Verify that the following two graphs are isomorphic or not. 	*CO1*	*PO1*	**06**
		b)	Let G be a disconnected graph of even order n with two components each of which is complete. Prove that G has a minimum of $\frac{n(n-2)}{4}$ edges.	*CO1*	*PO1*	**07**
		c)	Apply Dijkstra's algorithm to find the shortest path and its weight from vertex V_1 to vertex V_5 from the weighted, directed network shown below. 	*CO1*	*PO1*	**07**
			UNIT - 2			
	3	a)	Define Catalan number. Obtain the number of paths from $(2,1)$ to $(7,6)$ and not rise above the line $y=x-1$ using the moves $R:(x,y)\to(x+1,y)$ and $U:(x,y)\to(x,y+1)$.	*CO1*	*PO1*	**06**
		b)	Find the coefficient of xyz^2 in the expansion of $(2x-y-z)^4$.	*CO1*	*PO1*	**07**
		c)	Apply expansion formula to find the Rook polynomial for the following board for the non-shaded squares. 	*CO1*	*PO1*	**07**
			UNIT - 3			
	4	a)	Derive an expression for mean and variance of Poisson distribution.	*CO1*	*PO1*	**06**
		b)	Compute the coefficient of correlation and the equation of the lines of regression for the data: x: 1 2 3 4 5 6 7 y: 9 8 10 12 11 13 14	*CO1*	*PO1*	**07**

	c)	Fit a straight line $y = ax + b$ to the following data: x: 5, 10, 15, 20, 25 y: 16, 19, 23, 26, 30	*CO1*	*PO1*	**07**
		UNIT - 4			
5	a)	A machine runs on an average of 125 hours/year. A random sample of 49 machines has an annual average use of 126.9 hours with standard deviation 8.4 hours. Does this suggest to believe that machines are used on the average more than 125 hours annually at 0.05 level of significance?	*CO1*	*PO1*	**06**
	b)	The average weekly losses of man-hours due to strikes in an institute before and after a disciplinary program were implemented is as follows: Is there a reason to believe that the disciplinary program is effective at 5% level of significance? Before: 45, 73, 46, 124, 33, 57 After: 36, 60, 44, 119, 35, 51	*CO1*	*PO1*	**07**
	c)	A die is thrown 264 times and the number appearing on the face (x) follows the following frequency distribution: x: 1, 2, 3, 4, 5, 6 f: 40, 32, 28, 58, 54, 60 Fit a Poisson distribution to the data and test the goodness of fit at 1% level of significance.	*CO1*	*PO1*	**07**
		OR			
6	a)	In a random sample of 100 tube lights produced by company A, the mean lifetime (mlt) of tube light is 1190 hours with standard deviation of 90 hours. Also, in a random sample of 75 tube lights from company B the mean lifetime is 1230 hours with standard deviation of 120 hours. Is there a difference between the mean lifetimes of the two brands of tube lights at a significance level of 0.05?	*CO1*	*PO1*	**06**
	b)	The household net expenditure on health care in south and north India, in two samples of households, expressed as percentage of total income is shown in the following table: South: 15, 8, 3.8, 6.4, 27.4, 19, 35.3, 13.6, - North: 18.8, 23.1, 10.3, 8, 18, 10.2, 15.2, 19, 20.2 Test the equality of variances of household's net expenditure on health care in south and north India at 5% level of significance.	*CO1*	*PO1*	**07**
	c)	Random samples of specimens of coal from two mines A and B are drawn and their heat producing capacity (in millions of calories/ton) were measured yielding the following results: Mine A: 8350, 8070, 8340, 8130, 8260, - Mine B: 7900, 8140, 7920, 7840, 7890, 7950 Is there significant difference between the means of these two samples at 1% level of significance?	*CO1*	*PO1*	**07**

			UNIT - 5			
	7	a)	Find the linear congruence of $9x \equiv 6(mod\ 15)$.	*CO1*	*PO1*	**06**
		b)	Solve the following equation using Chinese Remainder Theorem $x \equiv 2(mod\ 3)$, $x \equiv 3(mod\ 5)$, $x \equiv 2(mod\ 7)$.	*CO1*	*PO1*	**07**
		c)	Find the remainder when 24^{1947} is divided by 17 using Fermat's theorem.	*CO1*	*PO1*	**07**

******