U.S.N.										

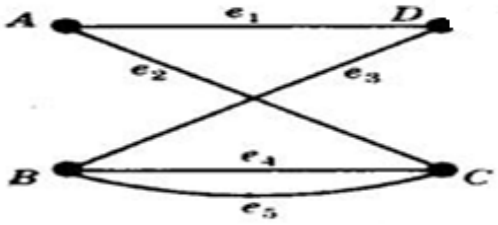
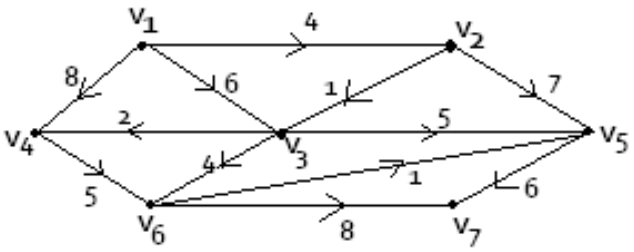
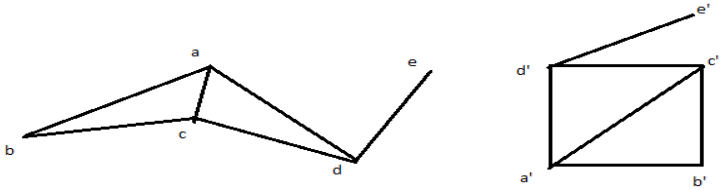
B.M.S. College of Engineering, Bengaluru-560019

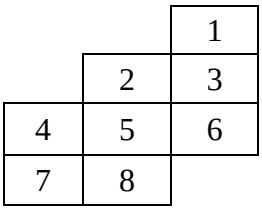
Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: CSE and 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.

			UNIT - I	CO	PO	Marks
1	a)		Prove that a connected graph G remains connected even after removing an edge e from G if and only if e is a part of some cycle in G.	CO1	PO1	**6**
	b)		For the given graph , write its incidence matrix.Hence, write any three observations on it. 	CO1	PO1	**7**
	c)		Apply Dijkstra's algorithm to find the shortest path and its weight from the vertex v_1 to v_7 in the following weighted directed graph. 	CO1	PO1	**7**
			OR			
2	a)		Define isomorphism. Determine whether the following graphs are isomorphic or not. 	CO1	PO1	**6**

	b)	Let G be a simple graph with n vertices and m edges where m is atleast3. If $m \geq \frac{1}{2}(n-1)(n-2)+2$, prove that G is a Hamilton graph.	CO1	PO1	**7**
	c)	Eight cities A, B, C, D, E, F, G, H are required to be connected by a new railway network. The possible tracks and the cost of involved to lay them (in crores of rupees) are summarized in the following Table: Track between / Cost / Track between / Cost A and B 155 D and F 100 A and D 145 E and F 150 A and G 120 F and G 140 B and C 145 F and H 150 C and D 150 G and H 160 C and E 95 - - Apply Kruskal's algorithm to determine a railway network of minimal cost that connects all these cities.	CO1	PO1	**7**
		UNIT - II			
3	a)	Using the moves $R:(x,y)\to(x+1,y)$ and $U:(x,y)\to(x,y+1)$. Find in how many ways can one go from $(2,6)$ to $(6,10)$ and not rise above the line $y=x+4$.	CO1	PO1	**6**
	b)	Find the coefficient of: i) $x^{11}y^4$ in the expansion of $\left(2x^3-3xy^2+z^2\right)^6$ ii) $x_1^{\,2}x_3x_4^{\,3}x_5^{\,4}$ in the expansion of $(x_1+x_2-x_3+2x_4-3x_5)^{10}$	CO1	PO1	**7**
	c)	By using the expansion formula, find the Rook polynomial for the board shown below.  	CO1	PO1	**7**
		UNIT - III			
4	a)	Fit a second-degree parabola to the following data: x: 1.0 1.5 2.0 2.5 3.0 3.5 4.0 y: 1.1 1.3 1.6 2.0 2.7 3.4 4.1	CO1	PO1	**6**
	b)	In the following table are recorded dates showing the test scores made by salesman on an intelligence test and their weekly sales. Test Scores: 40 70 50 60 80 50 90 40 60 60 Sales: 2.5 6.0 4.5 5.0 4.5 2.0 5.5 3.0 4.5 3.0 Calculate the regression line of sales on test scores and estimate the most probable weekly sales volume if a salesman makes a score of 70.	CO1	PO1	**7**

<table>
<tr><td></td><td></td><td>c)</td><td>A manufacturer of air-mail envelopes knows from experience that the weight of the envelopes is normally distributed with mean 1.95 gm and standard deviation 0.05 gm. About how many envelopes weighting (i) 2 gm or more (ii) 2.05 gm or less (iii) more than 2.05 but less than 1.9 can be expected in a given packet of 100 envelopes.</td><td>CO1</td><td>PO1</td><td>7</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - IV</td><td></td><td></td><td></td></tr>
<tr><td></td><td>5</td><td>a)</td><td>A random sample of 40 ‘geysers’ produced by company A have a mean lifetime of 647 hours of continuous use with a standard deviation of 27 hours, while a sample 40 produced by another company B have mean lifetime of 638 hours with standard deviation 31 hours. Does this substantiate the claim of company A that their ‘geysers’ are superior to those produced by company B at 0.01 level of significance?</td><td>CO1</td><td>PO1</td><td>6</td></tr>
<tr><td></td><td></td><td>b)</td><td>A corporate training institution claimed that its training program can greatly enhance the efficiency of call center employees. A big call center sent some of its employees for the training program. The efficiency was measured by the number of deals closed by each employee in a one-month period. Data was collected for a one-month period before sending the employees for the training program. After the training program, data was again collected on the same employees for a one-month period. Test the validity of the claim made by the training institution that its training program improves the efficiency of call center employees for the following data at $\alpha = 5\%$.
<table>
<tr><td>Employee</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>Before the training program</td><td>41</td><td>46</td><td>35</td><td>42</td><td>40</td></tr>
<tr><td>After the training program</td><td>44</td><td>39</td><td>36</td><td>40</td><td>48</td></tr>
</table></td><td>CO1</td><td>PO1</td><td>7</td></tr>
<tr><td></td><td></td><td>c)</td><td>Can we conclude that the two population variances are equal for the following data of post graduates passed out from a state and private university. Use 5% level of significance.
<table>
<tr><td>State</td><td>8350</td><td>8260</td><td>8130</td><td>8340</td><td>8070</td><td></td></tr>
<tr><td>Private</td><td>7890</td><td>8140</td><td>7900</td><td>7950</td><td>7840</td><td>7920</td></tr>
</table></td><td>CO1</td><td>PO1</td><td>7</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td>In a random sample of 10 bolts produced by a machine the mean length of bolt is 0.53 mm and standard deviation 0.03 mm. Can we claim from this that the machine is in proper working order if in the past it produced bolts of length 0.50 mm? Use 5% level of significance.</td><td>CO1</td><td>PO1</td><td>6</td></tr>
<tr><td></td><td></td><td>b)</td><td>A sample of 100 electric bulbs produced by manufacturer A showed a mean life time of 1190 hours and a standard deviation of 90 hours. A sample of 75 bulbs produced by manufacturer B showed a mean life time of 1230 hours and a standard deviation of 120 hours. Is there a difference between the mean lifetimes of two brands at $\alpha = 5\%$?</td><td>CO1</td><td>PO1</td><td>7</td></tr>
</table>

	c)	The number of computer malfunctions per day is recorded for 260 days with the following results. Number of malfunctions: 0, 1, 2, 3, 4, 5 Number of days: 77, 87, 55, 30, 5, 6 Fit a Poisson distribution and test for the goodness of fit at $\alpha = 5\%$.	CO2	PO1	**7**
		UNIT - V			
7	a)	Apply Fermat's Little theorem to find the remainder when 3^{100000} is divided by 53.	CO1	PO1	**6**
	b)	Apply Chinese Remainder theorem to solve the system of linear congruence's $x \equiv 2 \pmod 5$, $x \equiv 3 \pmod 7$ and $x \equiv 1 \pmod 8$.	CO2	PO1	**7**
	c)	Solve the congruence $x^3 + 3x + 5 \equiv 0 \pmod 9$.	CO2	PO1	**7**

****