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Set-1

Course Code: 23MCA1T02

**MALINENI LAKSHMAIAH WOMEN'S ENGINEERING COLLEGE**  
(AUTONOMOUS)

I-MCA I-Semester (MR23) Regular Examinations, March - 2024

**MATHEMATICAL & STATISTICAL FOUNDATIONS**

Time: 3 hours

Max. Marks: 70

Answer **ALL** the questions

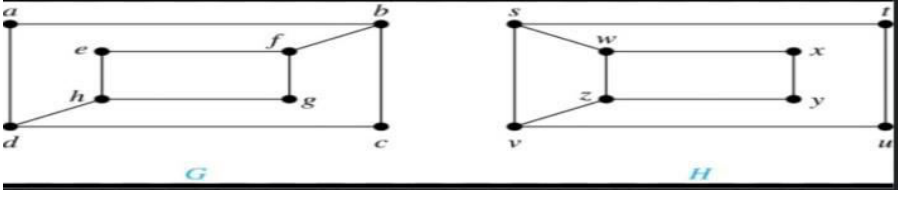
Q. No.	Question	Marks	CO	BL																		
1	a State and prove Addition theorem on probability. Box A contains 5 red and 3 white marbles and Box B contains 2 red and 6 white marbles. If a marble is drawn from each box, What is the probability that they are both of same colour.	(7M)	CO1	L2																		
	b State and Prove Bayes Theorem. A Businessman goes to hotels X, Y, Z, 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbing's. What is the probability that businessman's room having faulty plumbing is assigned to hotel Z?	(7M)	CO1	L2																		
<b>(OR)</b>																						
2	A random variable X has the following probability function: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td> </tr> <tr> <td>p(x)</td><td>0</td><td>K</td><td>2K</td><td>2K</td><td>3K</td><td>K<sup>2</sup></td><td>2K<sup>2</sup></td><td>7K<sup>2</sup> + K</td> </tr> </table>	x	0	1	2	3	4	5	6	7	p(x)	0	K	2K	2K	3K	K <sup>2</sup>	2K <sup>2</sup>	7K <sup>2</sup> + K	(7M)	CO1	L2
	x	0	1	2	3	4	5	6	7													
p(x)	0	K	2K	2K	3K	K <sup>2</sup>	2K <sup>2</sup>	7K <sup>2</sup> + K														
a (i) Determine K (ii) Evaluate $P(X < 6)$ , $P(X \geq 6)$ , $P(0 < X < 5)$ and $P(0 \leq X \leq 4)$ (iii) if $P(X \leq K) > 1/2$ , find the minimum value of K and, (iv) Determine the distribution function of X (v) Mean (vi) Variance																						
b	For the continuous random variable X whose probability density function is given by $f(x) = cx(2-x)$ , if $0 \leq x \leq 2$ and $f(x) = 0$ , otherwise where 'c' is a constant. Find c, mean and variance of X.	(7M)	CO1	L1																		

3	a A population consists of five numbers 2,3,6,8 and 11. Consider all possible samples of size two which can be drawn with replacement from this population. Find (i) The mean of the population. (ii) The standard deviation of the population. (iii) The mean of the sampling distribution of means and (iv) The standard deviation of the sampling distribution of means (i.e the standard Error of mean's)	(7M)	CO2	L3
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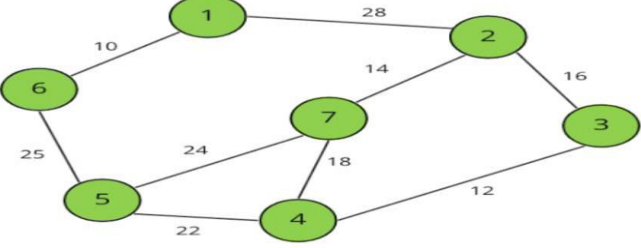
	b	A population consists of 5,10,14,18,13,24. Consider all possible samples of size two which can be drawn without replacement from the population. Find (i) The mean of the population. (ii) The standard deviation of the population. (iii) The mean of the sampling distribution of means. (iv) The standard deviation of the sampling distribution of means.	7M)	CO2	L2
<b>(OR)</b>					
4	a	Prove that for a random sample of size n, $X_1, X_2, \dots, X_n$ taken from an infinite population $x^2 = 1/n \sum_{i=1}^n (X_i - X)^2$ is not unbiased estimator of the parameter	(7M)	CO2	L2
	b	Find 95% confidence limits for the mean of a normality distributed population from which the following sample was taken 15, 17, 10, 18, 16, 9, 7, 11, 13, 14.	(7M)	CO2	L2

5	a	Explain the procedure generally followed in testing of hypothesis?	(7M)	CO3	L2														
	b	A manufacturer of electronic equipment subjects' samples of two completing brands of transistors to an accelerated performance test. If 45 to 180 transistors of the first kind and 34 of 120 transistors of the second kind fail the test, what can he conclude at the level of significance, $\alpha=0.05$ about the difference between the corresponding sample proportions?	(7M)	CO3	L2														
<b>(OR)</b>																			
6	a	A die is thrown 264 times with the following results. Show that the die is biased. [given $\chi^2_{0.05} = 11.07$ for 5 d.f] <table border="1" style="margin: 5px auto;"> <tr> <td style="text-align: center;">No. appeared on the die</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> </tr> <tr> <td style="text-align: center;">Frequency</td> <td style="text-align: center;">40</td> <td style="text-align: center;">32</td> <td style="text-align: center;">28</td> <td style="text-align: center;">58</td> <td style="text-align: center;">54</td> <td style="text-align: center;">52</td> </tr> </table>	No. appeared on the die	1	2	3	4	5	6	Frequency	40	32	28	58	54	52	(7M)	CO3	L3
	No. appeared on the die	1	2	3	4	5	6												
Frequency	40	32	28	58	54	52													
b	Explain briefly about chi-square test	(7M)	CO3	L2															

7	a	Explain algebraic system. If P(S) is the power set of S then determine which of the algebraic properties are satisfied by the system $\langle P(S), \cup, \cap \rangle$	(7M)	CO4	L3
	b	if $G = \langle Z_6, + \rangle$ , $H = \langle Z_3, + \rangle$ and $K = \langle Z_2, + \rangle$ prove that G and $H * K$ is Isomorphic.	(7M)	CO4	L2
<b>(OR)</b>					
8	a	State and prove Euclid theorem. If $a=1820$ and $b=231$ then find $\gcd(a,b)$ . Express $\gcd$ as a linear combination of a and b.	(7M)	CO4	L3
	b	Compute the inverse of each element in $Z_7$ using Fermat's theorem.	(7M)	CO4	L3

<b>9</b>	a	Explain different ways of representation of graphs.	(7M)	CO5	L1
	b	<p>Show that the below graphs are Isomorphic graphs.</p> 	(7M)	CO5	L3

**OR**

<b>10</b>	a	Differentiate between Euler and Hamiltonian Graphs.	(5M)	CO5	L4
	b	<p>Find the minimum spanning tree for the graph using Kruskal's algorithm.</p> 	(5M)	CO5	L3

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MODEL QUESTION PAPER