CMR Technical Campus

B. Tech Mid Question Bank (R22 Regulation)

Academic Year: 2024-2025 **Semester: III**

Subject Name: COSM

Subject Code: 22MA301BS

Faculty Name: Dr. K. Bhagya Lakshmi

PART-A

MID-I Questions					
Q. No	**Questions**	**Marks**	**BL**	**CO**	**Unit No**
1	Define random variable.	2	L1	CO1	I
2	Define, Discrete, Continuous random variable with example.	2	L1	CO1	I
3	Define covariance of random variables.	2	L2	CO1	I
4	If x is a discrete Random variable , Show that E(a x +b) = a E (x) +b	2	L1	CO1	I
5	If X & Y is a random variable then Prove E[X+K]= E[X]+K ,where 'K' constant	2	L2	CO1	I
6	Describe the measures of continuous probability distribution.	2	L2	CO1	I
7	Derive the mean of Poisson distribution.	2	L1	CO2	II
8	Classify properties of normal distribution	2	L1	CO2	II
9	Explain binomial distribution, Poisson distribution.	2	L2	CO2	II
10	Write two applications of Normal distribution.	2	L1	CO2	II
11	Determine the binomial distribution for which the mean is 4 and variance 3.find $p(X \geq 1)$.	2	L1	CO2	II
12	Find the standard deviation of a binomial distribution with n=12 and p=0.6.	2	L2	CO2	II
13	Define population, sample, parameter & statistics.	2	L1	CO3	III
14	(i)Define small sample, large sample. (ii) What is the value of the correction factor if n=5, N=200.	2	L1	CO3	III
15	Explain about Central limit theorem.	2	L1	CO3	III
MID-II Questions					
16	Demonstrate Properties of t- distribution.	2	L2	CO3	III

17	Define (i) F – test (ii) chi-square test.	2	L1	CO3	III
18	Find t values at level of significance 0.05 (one tail test) i) degree of freedom v = 16 ii) degree of freedom v = 10 .	2	L1	CO3	III
19	Define Estimate and Estimator. Give example.	2	L1	CO4	IV
20	Explain Types of Estimation and properties of Estimation.	2	L2	CO4	IV
21	Define Correlation and Types of Correlation.	2	L1	CO4	IV
22	Define Rank Correlation Coefficient and Properties.	2	L1	CO4	IV
23	Explain regression,	2	L2	CO4	IV
24	Explain correlation coefficient.	2	L2	CO4	IV
25	Define One tail and Two Tail Test	2	L1	CO5	V
26	Explain null hypothesis and alternative hypothesis.	2	L2	CO5	V
27	Define type I and type II errors.	2	L1	CO5	V
28	Define Critical Region and Level of significance.	2	L1	CO5	V
29	Define Student's t –test, F-Test	2	L1	CO5	V
30	Explain Chi -Square Test as a Goodness of Fit and Conditions	2	L1	CO5	V

PART-B

MID-I Questions

Q .No	Questions	Marks	BL	CO	Unit No
1	A random variable X has the following probability function: X: 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 P(x): 0 | K | 2k | 2k | 3k | k^2 | $2k^2$ | $7k^2+k$ Evaluate (i) k (ii) P(X<6),P(X≥6), P(0<X<5) and p(0≤X≤4) (iii) mean (iv) variance.	8	L5	CO1	I
2	A random variable X has the following probability function: X: 0 | 1 | 2 | 3 | 4 | 5 | 6 P(x): k | 3k | 5k | 7k | 9k | 11k | 13k Evaluate (i) k (ii) P(X<3), P(x≥3) and P(0<X<5)(iii)Mean (iv)Varience	4	L5	CO1	I
3	Suppose a continuous random variable x has the	8	L2	CO1	I

	probability density f(x) = kx^2e^{-x}, for x>0 , Find (i) K (ii) Mean (iii) variance.				
4	If a random variable has the probability density function f(x) = $\begin{cases} k(x^2-1), -1 \le x \le 3. \\ 0, elsewhere \end{cases}$ Find value of k and p($\frac{1}{2} \le x \le \frac{5}{2}$).	4	L2	CO1	I
5	Let X denote the maximum of the two numbers that appear when a pair of fair dice is thrown once. Determine the (i) Discrete probability distribution (ii) Expectation (iii) variance.	4	L5	CO1	I
6	A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items.	4	L1	CO1	I
7	Probability density function of random variable x is f(x) = $\begin{cases} \frac{1}{2}sinx, for\ 0 < x < \pi \\ 0, for\ x \le 0 \end{cases}$ Evaluate mean, mode and median of the distribution and Find the probability between 0 and $\frac{\pi}{2}$.	8	L5	CO1	I
8	A random variable X is defined as the sum of the numbers on the faces when two dice are thrown. Find the mean and variance of X.	4	L1	CO1	I
9	If X is a continuous Random Variable Show That E(aX+b)=aE(X)+b & V(aX+b)=a^2V(X)	4	L1	CO1	I
10	Ten coins are thrown simultaneously .Find the probability of getting at least (i)One head(ii)Six heads (iii)eight heads	4	L1	CO2	II
11	If X is a normal variate with mean 30 and standard deviation 5. Find the probabilities that i) 26<X<40 ii) X>45	4	L1	CO2	II
12	If x is a Poisson variant such that 3 p(x=4)= 1/2(P (x=2)+ P (x=0)) Evaluate (i) The mean of x (ii) P (x≤2).	4	L5	CO2	II
13	The probability of a defective bolt is 1/8, find (i) the mean (ii) The variance for the distribution of defective bolts of 640.	4	L1	CO2	II

14	20 % of items produced from a factory are defective. Evaluate the probability that in a sample of 5 chooser at random (i) none is defective (ii) one is defective (iii) p(1<x<4).	4	L5	CO2	II
15	In a normal distribution 40% of the items are under 30 and 15% are over 60. Find the mean and variance of the distribution	4	L1	CO2	II
16	The probabilities of a man hitting a target is 1/3 .If he fires 6 times, find the probability that he fires (i) at the most 5 times (ii) exactly once (iii) At least two times.	8	L1	CO2	II
17	Determine Poisson frequency distribution for the following data x: 0, 1, 2, 3, 4 f(x): 109, 65, 22, 3, 1	8	L5	CO2	II
18	Derive the mean and variance of a Binomial distribution.	8	L6	CO2	II
19	A population consist of 1,2,3,4,5,6 . Consider all samples of size 2 which can be drawn without replacement . (a)Find mean , standard deviation of the population; (b) The mean of sampling distribution of means; (c) The standard deviation of sampling distribution of means.	4	L1	CO3	III
20	If the population is 2,3,6,8,11. Consider all samples of size 2 which can be drawn with replacement . (a)Find mean , standard deviation of the population. (b) The mean of sampling distribution of means. (c) The standard deviation of sampling distribution of means.	4	L1	CO3	III
21	The mean of certain normal population is equal the standard error of the mean of the samples of 64 from that distribution. Find the probability that the mean of the sample size 36 will be negative.	4	L1	CO3	III
22	A random sample of size 100 is taken from an infinite Population having the mean $\mu = 76$ & $variance\ \sigma^2 = 256$.What is the probability that $\bar{x}$ will be between 75 &78	4	L1	CO3	III

<table>
<tr><th colspan="6">MID-II Questions</th></tr>
<tr><td>23</td><td>What is the effect on standard error ,if a sample is taken from an infinite population of sample size is increased from 400 to 900.</td><td>4</td><td>L1</td><td>CO3</td><td>III</td></tr>
<tr><td>24</td><td>Explain t-Distribution, properties and Applications of t-Distribution and Explain Degrees Of Freedom.</td><td>4</td><td>L2</td><td>CO3</td><td>III</td></tr>
<tr><td>25</td><td>Explain F-Distribution, properties and Applications of F-Distribution</td><td>4</td><td>L2</td><td>CO3</td><td>III</td></tr>
<tr><td>26</td><td>Explain chi square -Distribution, properties and Applications and conditions</td><td>4</td><td>L2</td><td>CO3</td><td>III</td></tr>
<tr><td>27</td><td>Find Karl Pearson’s coefficient of correlation from the following data
<table>
<tr><td>Wages</td><td>100</td><td>101</td><td>102</td><td>102</td><td>100</td><td>99</td><td>97</td><td>98</td><td>96</td><td>9</td></tr>
<tr><td>Cost of living</td><td>98</td><td>99</td><td>99</td><td>97</td><td>95</td><td>92</td><td>95</td><td>94</td><td>90</td><td>9</td></tr>
</table></td><td>8</td><td>L1</td><td>CO4</td><td>IV</td></tr>
<tr><td>28</td><td>Evaluate rank correlation coefficient for the following data
<table>
<tr><td>x</td><td>68</td><td>64</td><td>75</td><td>50</td><td>64</td><td>80</td><td>75</td><td>40</td><td>55</td><td>64</td></tr>
<tr><td>y</td><td>62</td><td>58</td><td>68</td><td>45</td><td>81</td><td>60</td><td>68</td><td>48</td><td>50</td><td>70</td></tr>
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<tr><td>29</td><td>Examine the regression equations of Y on X from the data given below , taking deviations from actual means of X and Y.
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<tr><td>31</td><td>The mean and s.d. of population are 11,795 and 14,054 respectively if n = 50. Construct 95% confidence interval for the mean.</td><td>4</td><td>L4</td><td>CO4</td><td>IV</td></tr>
<tr><td>32</td><td>A random sample of size 100 has a standard deviation of 5 what can u say about maximum error with 95%</td><td>4</td><td>L1</td><td>CO4</td><td>IV</td></tr>
</table>

	confidence.				
33	Construct a straight line to the form for the following data X: 1, 2, 3, 4, 5 Y: 14, 27, 40, 55, 68	4	L3	CO4	IV
34	By the method of least squares Construct a parabola $y = a + bx + cx^2$ for the following data X: 0, 1, 2, 3, 4 Y: 1, 1.8, 1.3, 2.5, 6.3	4	L3	CO4	IV
35	Find the coefficient of correlation to the following data X: 12, 9, 8, 10, 11, 13, 7 Y: 14, 8, 6, 9, 11, 12, 3	4	L1	CO4	1V
36	In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance. Apply the test significance of single proportion	4	L3	CO5	V
37	A sample of 64 students have a mean weight of 70kgs. Can this be regarded as sample from a population with mean weight 56kgs and standard deviation of 25kgs. Explain the hypothesis for single mean.	4	L2	CO5	V
38	samples of students were drawn from two universities and from their weights in kilograms mean and S.D are calculated and shown below make a large sample test for the significance of difference between means. University-A: MEAN 55, S.D 10, SAMPLE SIZE 400 University-B: MEAN 57, S.D 15, SAMPLE SIZE 100	4	L6	CO5	V
39	A random sample of 400 men and 600 women in a locality were asked whether they would like to have a bus stop near their residence. 200 men and 325 women are in favour of the proposal test for the significant difference between two proportions at 5% level.	4	L6	CO5	V
40	A Random sample of 10 boys had the following I.Q.'s	8	L1	CO5	V

	70,120,110,101,88,83,95,98,107 and 100 a. Do these data support the assumption of a population mean I.Q. of 100? b. Find a reasonable range in which most of the mean I.Q. values of sample of 10 boys lie					
41	Two compare two kinds of bumper guards , 6 of each kind were mounted on a car and then the car was run into a concrete wall . The following are the costs of repairs Guard 1: 107, 148, 123, 165, 102, 119 Guard 2: 134, 115, 112, 151, 133, 129 Use the 0.01 level of significance to test for the difference between two sample means is significant.	8	L3	CO5	V
42	The Mean of two random samples of sizes 9 and 7 are 196.42 and 198.82 respectively. The Sum of squares of the deviations from the mean are 26.94 and 18.73 respectively. Can the sample be considered to have been drawn from the Same normal population. Test for the significance	4	L4	CO5	V
43	Pumpkins were grown under two experimental conditions. Two Random samples of 11 and 9 pumpkins, show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test for hypothesis that the variances are equal.	4	L4	CO5	V
44	From the following data, find whether there is any significant liking in the habit of taking soft drinks among the categories of employees. Apply chi- square test .	8	L3	CO5	V

Employees

Soft drinks	**Clerks**	**Teachers**	**Officers**
Pepsi	10	25	65
Thums up	15	30	65
Fanta	50	60	30