NARASIMHA REDDY ENGINEERING COLLEGE
(Autonomous)
Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad
Accredited by NAAC with A Grade, Accredited by NBA

COMPUTER SCIENCE ENGINEERING

QUESTION BANK

Course Title : COMPUTER ORIENTED STATISTICAL METHODS

Course Code : MA2103BS

Regulation : NR21

Course Objectives

1. To learn theory of probability and probability distributions of single and multiple random variables.
2. The sampling theory and testing of hypothesis and making inferences.

Course Outcomes (CO's)

1. Apply the concept of Probability and distribution to some case studies,
2. Correlate the material of one unit to the material in other units.
3. Resolve the potential misconceptions and hazards in each topics of study.

UNIT–I
PROBABILITY

S.No	Questions	BT	CO	PO
Part – A (Short Answer Questions)				
1	Define conditional probability.	L1	CO1	PO1
2	Define pairwise independent events.	L1	CO1	PO3
3	Suppose a continuous random variable X has a probability density function $f(x)=k(1-x^2)$ for $0<x<1$ and $f(x)=0$ otherwise, then find k.	L3	CO1	PO1
4	For the following probability distribution find $E(x),E(x^2)$, $E[(2x+1)^2]$ X: -3, 6, 9 P(x): 1/6, ½, 1/3	L3	CO1	PO2

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5		Write the relation between raw and central moments.	L1	CO1	PO2
6		An integer is chosen at random from the first 200 positive integers. What is the probability that the integer chosen is divisible by 6 or by 8.	L3	CO1	PO1
7		A bag contains 3 white and 5 black balls. If a ball is drawn at random find the probability for it to be black.	L3	CO1	PO1
8		Write the formulas of skewness and kurtosis in terms of moments.	L1	CO1	PO1
9		A bag contains 50 tickets numbered 1,2, 3,…50. Of which 5 are drawn at random and arranged in ascending order of the magnitude. What is the probability that the middle one is 30?	L2,L3	CO1	PO2
10		In a single throw with two dice find the probability of throwing a sum 10.	L3	CO1	PO2
		Part – B (Long Answer Questions)			
11	a)	State and prove Bayes theorem.	L1	CO1	P01
	b)	Of the three men, the chances that a politician, a businessman or an academician will be appointed as a vice-chancellor (V.C) of a university are 0.5,0.3,0.2 respectively. Probability that research is promoted by these persons if they are appointed as V.C are 0.3,0.7,0.8 respectively. i) Determine the probability that research is promoted. If the research is promoted what is the probability that V.C is ii) academician? iii) Business man iv) Politician	L1,L3	CO1	P02
13		The probability density f(x) of a continuous random variable is given by $f(x) = ce^{-\|x\|}, -\infty < x, \infty$ Show that c=1/2 and i. Find that the mean and variance of the distribution. ii. Find the probability that the variate lies between 0 and 4. iii. Find the probability that x>6.	L3,L4	CO1	PO3

<table>
<tr><td>14</td><td>a)</td><td>In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair and brown eyes, a person is selected at random from the town.
i. If he has brown hair, what is the probability that he has brown eyes also?
ii. If he has brown eyes, determine the probability that he does not have brown hair?</td><td>L3,L4</td><td>CO1</td><td>PO3</td></tr>
<tr><td></td><td>b)</td><td>From a city 3 newspapers A, B, C are being published. A is read by 20%, B is read by 16%, C is read by 14%, both A and B are read by 8%, both A and C are read by 5%, both B and C are read by 4% and all three A, B, C are read by 2%. What is the percentage of the population that read at least one paper?</td><td>L3,L4</td><td>CO1</td><td></td></tr>
<tr><td>15</td><td>a)</td><td>Two aero planes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that
i. Target is hit
ii. Both fails to score hits</td><td>L2,L4</td><td>CO1</td><td>PO1</td></tr>
<tr><td></td><td>b)</td><td>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.</td><td>L2,L4,L5</td><td>CO1</td><td>PO2</td></tr>
<tr><td>16</td><td></td><td>Calculate the first four moments of the following about the arbitrary origin. Also find the moments about the mean.
<table><tr><td>Class interval</td><td>60-62</td><td>63-65</td><td>66-68</td><td>69-71</td><td>72-74</td></tr><tr><td>Frequency</td><td>5</td><td>18</td><td>42</td><td>27</td><td>8</td></tr></table></td><td>L3,L5</td><td>C01</td><td>PO1</td></tr>
</table>

UNIT–II

MATHEMATICAL EXPECTATIONS AND DISCRETE PROPABIBLITY DISTRIBUTIONS

S. No	Questions	BT	CO	PO
	Part – A (Short Answer Questions)			
1	Define expectation of a random variable X	L1	CO2	PO1
2	Define variance of a random variable X for discrete and continuous cases.	L1	CO2	PO1
3	Let X be a random variable with density function	L3	CO2	PO2

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		$f(x) = \begin{cases} \frac{x^3}{3}, -1 < x < 2 \\ 0, else\ where \end{cases}$ Find the expected value of g(x)=4x+3			
4		Let the random variable X represent the number of defective parts for a machine when 3 parts are sampled from a production line and tested. The following is the probability distribution of X. <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>F(x)</td><td>0.51</td><td>0.38</td><td>0.10</td><td>0.01</td></tr></table>Calculate E(X) and E(X^2).	L3	CO2	PO2
5		20% of item produced from a factory are defective. Find the probability that in a sample of 5 chosen at random P(1<x<4).	L3	CO2	PO2
6		If the probability of a defective bolt is 0.2 find the mean and variances of the number of successes.	L3	CO2	PO2
7		Define geometric distribution.	L1	CO2	PO1
8		If a random variable has a Poisson distribution such that P(1) =P(2), find mean of the distribution.	L3	CO2	PO2
9		Using Poisson distribution, find the probability that the ace of spades will be drawn from a pack of well shuffled cards at least once in 104 consecutive trials.	L3	CO2	PO2
10		In 256 set of 12 tosses of a coin, in how many cases one can expect 8 heads and 4 tails.	L3	CO2	PO2
Part – B (Long Answer Questions)					
11		Seven coins are tossed and the number of heads are noted. The experiment is repeated 128 times and the following distribution is obtained. Fit a Binomial Distribution to the following data assuming the coin is unbiased <table><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>f</td><td>7</td><td>6</td><td>19</td><td>35</td><td>30</td><td>23</td><td>7</td><td>1</td></tr></table>	L3,L5	CO2	PO3
12	a)	Using recurrence formula find the probabilities when X=0,1,2,3,4 and 5, if the mean of Poisson distribution is 3.	L3,L5	CO2	PO3
	b)	If the probability that an individual suffers a bad reaction from a certain injection is 0.001, determine the probability that out of 2000 individuals i. Exactly 3 ii. More than 2 individuals iii. None	L3	CO2	PO2

		iv. More than one individual suffers bad reaction			
13	a)	Derive mean and variance of Geometric Distribution	L1	CO2	PO1
	b)	The weekly demand for a drinking-water product, in thousands of liters, from a local chain of efficiency stores is a continuous random variable X having the probability density. Find mean and variance. $f(x) = \begin{cases} 2(x-1); 1 < x < 2 \\ 0; else\ where \end{cases}$	L3	CO2	PO2
14		Out of 800 families with 5 children each, how many would you expect to have a. 3boys b. 5girls c. At least one boy d. Mean e. Variance	L3,L4,L5	CO2	PO3
15	a)	Derive mean and variance of Poisson distribution	L1	CO2	PO1
	b)	A die is tossed until 6 appears. Find the probability that it must be cast more than 5 times.	L2	CO2	PO2
16	a)	If a Poisson Distribution is such that $\frac{3}{2}P(X=1) = P(X=3)$. Find i. P(X≥1) ii. P(X≤3)	L2	CO2	PO2
	b)	Calculate the variance of g(X)=2X + 3, where X is a random variable with the following probability distribution <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>F(x)</td><td>1/4</td><td>1/8</td><td>1/2</td><td>1/8</td></tr></table>	L3	CO2	PO2

UNIT–III

CONTINUOUS PROBABILITY DISTRIBUTION

S.No	Questions	BT	CO	PO
	Part – A (Short Answer Questions)			
1	State the conditions under which Normal distribution is a limiting case of Binomial.	L1	CO3	PO1
2	If X is a Normal variate with mean 30 and standard deviation 5. find P(26≤X≤40).	L2	CO3	PO2
3	Define Normal distribution.	L1	CO3	PO1

4		Define statistic and standard error of a statistic.	L1	CO3	PO1
5		Find the value of the finite population correction factor for n=10 and N=100.	L3	CO3	PO2
6		A mobile conversation follows an Exponential distribution $f(x) = \frac{1}{3}e^{-x/3}$. What is the probability that the conversation takes more than 5 mins.	L3	CO3	PO2
7		Define Uniform Distribution and write its mean and variance.	L1	CO3	PO1
8		The variance of a population is 2. The size of the sample collected from the population is 169. What is the standard error of mean.	L3	CO3	PO2
9		Three masses are measured as 62.34,20.48,35.97kgs with standard deviation 0.54,0.21,0.46 kgs. Find the mean and standard deviation of the sum of the masses.	L3	CO3	PO2
10		A population consists 5,10,14,18,13,24. Consider all possible samples of size two which can be drawn without replacement from the population. Find mean and variance of the population.	L3	CO3	PO2
		Part – B (Long Answer Questions)			
11	a)	In a normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution	L4,L5	CO3	PO3
	b)	If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3kgs how many students have masses i. Greater than 72kgs ii. Less than or equal to 64 kgs	L3	CO3	PO2
12	a)	A sample of 26 bulbs gives a mean life of 990 hours with a standard deviation of 20 hours. The manufacturer claims that the mean of bulbs is 1000hrs. is the sample not up to standard	L3	CO3	PO2
	b)	The means of two random samples of sizes 9 and 7 are 196.42 and 198.82 respectively. The sum of the squares of the deviations from the mean are 26.94 and 18.73 respectively. Can the sample be considered to have been from the same normal population	L3	CO3	PO2
13	a)	Memory capacity of 10 students were tested before and after training <table><tr><td>Before</td><td>12</td><td>14</td><td>11</td><td>8</td><td>7</td><td>10</td><td>3</td><td>0</td><td>5</td><td>6</td></tr><tr><td>After</td><td>15</td><td>16</td><td>10</td><td>7</td><td>5</td><td>12</td><td>10</td><td>2</td><td>3</td><td>8</td></tr></table>Test whether the intensive training is useful at 5% level of significance.	L4,L5	CO3	PO3

	b)	The number of automobile accidents per week in a certain community are as follows:12,8,20,2,14,10,15,6,9,4. Are these frequencies in agreement with the belief that the accident conditions were same during this 10-week period	L3	CO3	PO2
14	a)	Find the probability that out of 100 patients between 84 and 95 inclusive will survive a heart- operation given that the chances of survival is 0.9.	L3	CO3	PO2
	b)	Given the following contingency table for hair color and eye color. Find the value of χ^2. Is there good association between the two.	L3	CO3	PO2

	Hair color				
		Fair	Brown	Black	Total
Eye color	Blue	15	5	20	40
	Grey	20	10	20	50
	Brown	25	15	20	60
	Total	60	30	60	150

15		The nicotine contents in milligrams in two samples of tobacco were found to be as follows:	L2,L3	CO3	PO2

Sample A	24	27	26	21	25	--
Sample B	27	30	28	31	22	36

Can it be said that the two samples have come from the same normal population.

16		A population consists of five numbers 2,3,6,8,11. 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 sampling distributions of means and iv. The standard deviation of the sampling distributions of means	L2,L3	CO3	PO2

UNIT–IV

TESTING OF HYPOTHESIS- LARGE SAMPLE

S.No	Questions	BT	CO	PO
	Part – A (Short Answer Questions)			
1	Define Type-I and Type-II error	L1	CO4	PO1
2	Define critical region and acceptance region.	L1	CO4	PO1
3	Explain Null and Alternative Hypothesis.	L4	CO4	PO1
4	Write Standard error formula for Method of Substitution and Method of Pooling in Proportions.	L1	CO4	PO1

5		The mean and standard deviation of a population are 11795 and 14054 respectively. If n=50, find 95% confidence interval for the mean.	L3	CO4	PO1
6		A die is tossed 256 times and it turns up with an even digit 150 times. If the die is biased find the test statistic value.	L3	CO4	PO1
7		If $n = 400, \bar{x} = 40, \mu = 38, \sigma = 10$ then find the 95% confidence limits for the population.	L1	CO4	PO1
8		A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Find the percentage of bad pineapples in the consignment.	L2,L3	CO4	PO1
9		Given $n_1 = 1200, n_2 = 900, P_1 = 0.3, P_2 = 0.25$ then find the test statistic value for difference of two proportions of large samples.	L2	CO4	PO1
10		Define Level of Significance.	L1	CO4	PO1
		Part – B (Long Answer Questions)			
11	a)	A sample of 64 students have a mean weight of 70kgs. Can this be regarded as a sample from a population with mean weight 56kgs and standard deviation 25kgs.	L3,L4	CO4	PO2
	b)	Explain the steps involved in the procedure for testing of Hypothesis	L2,L4,L5	CO4	PO3
12	a)	The mean yield of wheat from a district A was 210 pounds with S.D 10 pounds per Acre from a sample of 100 plots. In another district the mean yield was 220 pounds with S. D 12 pounds from a sample of 150 plots. Assuming that the S.D of yield in the entire state was 11 pounds ,test whether there is any significant difference between the mean yield of crops.	L1,L4,L5	CO4	PO3
	b)	Samples of students were drawn from two universities and from their weights in kilograms, mean and standard deviation are calculated and shown below. Make a large sample test to test the significance of the difference between the means	L3,L4	CO4	PO2

	Mean	S.D	Size of the sample
University A	55	10	400
University B	57	15	100

13	a)	A die was thrown 9000 times and of these 3220 yielded a 3 or 4. Is this consistent with the hypothesis that the die was unbiased?	L2,L3	CO4	PO3
	b)	Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that proportions of men and women in favor of proposal are same at 5% level.	L3,L4	CO4	PO3
14	a)	A cigarette manufacturing firm claims that its brand A line of cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B, test whether the 8% difference is a valid claim.	L3,L4	CO4	PO3
	b)	In two large populations, there are 30% and 25% respectively of fair-haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations.	L3,L4	CO4	PO3
15	a)	Write a short note on one-tailed and two-tailed tests.	L1,L4	CO4	PO1
	b)	Explain Type-I and Type-II errors in detail with one example each.	L1,L4	CO4	PO1
16	a)	It is claimed that a random sample of 49 tyres has a mean life of 15200kms. This sample was drawn from a population whose mean is 15150kms and a standard deviation 1200 kms. Test the significance at 0.05 level for H_1: $\mu \neq 15200$	L1,L3	CO4	PO2
	b)	In a sample of 1000 people in Telangana 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.	L3,L4	CO4	PO3

UNIT–V
CORRELATION AND REGRESSION

S.No	Questions	BT	CO	PO
	Part – A (Short Answer Questions)			
1	Define correlation and regression.	L1	CO5	PO1
2	Write a short note on types of correlation.	L1	CO5	PO1
3	Criticize the following: Regression coefficient of Y on X is 0.7 and that of X on Y is 3.2.	L2,L4	CO5	PO2
4	If θ is the angle between two regression lines and standard deviation of Y is twice the standard deviation of X and r=0.25, find $\tan\theta$.	L2,L3	CO5	PO1

<table>
<tr><td colspan="2">5</td><td>From the following data calculate correlation coefficient and standard deviation of Y, given $b_{xy} = 0.85, b_{yx} = 0.89 \ and \ \sigma_x = 3.$</td><td>L2,L3</td><td>CO5</td><td>PO1</td></tr>
<tr><td colspan="2">6</td><td>Find the regression line of X on Y and Yon X. given $\bar{X} = 83.67, \bar{Y} = 88.42, b_{xy} = 0.795, b_{yx} = 0.59$</td><td>L2,L3</td><td>CO5</td><td>PO1</td></tr>
<tr><td colspan="2">7</td><td>Write the formula for correlation coefficient for Bivariate data.</td><td>L1</td><td>CO5</td><td>PO1</td></tr>
<tr><td colspan="2">8</td><td>Write the formula for regression of Bivariate data.</td><td>L1</td><td>CO5</td><td>PO1</td></tr>
<tr><td colspan="2">9</td><td>Write the properties of correlation coefficient.</td><td>L1</td><td>CO5</td><td>PO1</td></tr>
<tr><td colspan="2">10</td><td>Give a short note on Karl Pearson’s coefficient of correlation.</td><td>L1</td><td>CO5</td><td>PO1</td></tr>
<tr><td colspan="6">Part – B (Long Answer Questions)</td></tr>
<tr><td rowspan="2">11</td><td>a)</td><td>Psychological tests of Intelligence and of engineering ability were applied to 10 students. Here is a record of ungrouped data showing intelligence ratio (I.R) and Engineering ratio (E.R). Calculate the coefficient of correlation.
<table>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td><td>J</td></tr>
<tr><td>I.R</td><td>105</td><td>104</td><td>102</td><td>101</td><td>100</td><td>99</td><td>98</td><td>96</td><td>93</td><td>92</td></tr>
<tr><td>E.R</td><td>101</td><td>103</td><td>100</td><td>98</td><td>95</td><td>96</td><td>104</td><td>92</td><td>97</td><td>94</td></tr>
</table></td><td>L4,L5</td><td>CO5</td><td>PO3</td></tr>
<tr><td>b)</td><td>Following are the rank obtained by 10 students in two subjects’ statistics and Mathematics. To what extent the knowledge of the students in two subjects is related.
<table>
<tr><td>statistics</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Mathematics</td><td>2</td><td>4</td><td>1</td><td>5</td><td>3</td><td>9</td><td>7</td><td>10</td><td>6</td><td>8</td></tr>
</table></td><td>L4,L5</td><td>CO5</td><td>PO4</td></tr>
<tr><td rowspan="2">12</td><td>a)</td><td>Obtain the 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>
</table></td><td>L4,L5</td><td>CO5</td><td>PO3</td></tr>
<tr><td>b)</td><td>Given the following information regarding a distribution $N = 5, \bar{X} = 10, \bar{Y} = 20, \sum(X-4)^2 = 100, \sum(Y-10)^2 = 160.$ Find the Regression coefficients and correlation coefficient.</td><td>L3</td><td>CO5</td><td>PO2</td></tr>
<tr><td rowspan="2">13</td><td>a)</td><td>Calculate the regression equations of Y on X from the data given below, taking deviations from actual means of X and Y.
<table>
<tr><td>Price (Rs.)</td><td>10</td><td>12</td><td>13</td><td>12</td><td>16</td><td>15</td></tr>
<tr><td>Amount Demanded</td><td>40</td><td>38</td><td>43</td><td>45</td><td>37</td><td>43</td></tr>
</table>
Estimate the likely demand when the price is Rs.20.</td><td>L3,L4</td><td>CO5</td><td>PO3</td></tr>
<tr><td>b)</td><td>Fit a second-degree polynomial to the following data by the method of least squares
<table>
<tr><td>x</td><td>10</td><td>12</td><td>15</td><td>23</td><td>10</td></tr>
<tr><td>y</td><td>14</td><td>17</td><td>23</td><td>25</td><td>21</td></tr>
</table></td><td>L3</td><td>CO5</td><td>PO3</td></tr>
<tr><td>14</td><td>a)</td><td>Using the method of least square determine the constants a and b such that $y = ae^{bx}$ fits the following data.</td><td>L2,L3</td><td>CO5</td><td>PO2</td></tr>
</table>

x	0	0.5	1	1.5	2	2.5
y	0.10	0.45	2.15	9.15	40.35	180.75

b) Calculate Karl Pearson's correlation coefficient for the following paired data. — L2,L3 — CO5 — PO2

X	28	41	40	38	35	33	40	32	36	33
Y	23	34	33	34	30	26	28	31	36	38

What inference would you draw from the estimate.

15 Calculate coefficient of correlation between the marks obtained by a batch of 100 students in Accountancy and statistics are given below. — L4,L5 — CO5 — PO3

Marks in Statistics	Marks in Accountancy					
	20-30	30-40	40-50	50-60	60-70	Total
15-25	5	9	3	-	-	17
25-35		10	25	2	-	37
35-45		1	12	2		15
45-55			4	16	5	25
55-65				4	2	6
Total	5	20	44	24	7	100

16 The following are the marks obtained by 132 students in test X and test Y. — L4,L5 — CO5 — PO3

X\Y	30-40	40-50	50-60	60-70	70-80	Total
20-30	2	5	3			10
30-40	1	8	12	6		27
40-50		5	22	14	1	42
50-60		2	16	9	2	29
60-70		1	8	6	1	16
70-80			2	4	2	8
Total	3	21	63	39	6	132

Calculate correlation coefficients and regression equations

* **Blooms Taxonomy Level (BT)** (L1 – Remembering; L2 – Understanding; L3 – Applying; L4 – Analyzing; L5 – Evaluating; L6 – Creating)
Course Outcomes (CO)Program Outcomes (PO)

Prepared By: **HOD**

P MAHENDRA VARMA

ASSISTANT PROFESSOR

MATHEMATICS, H&S