

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

Regular &amp; Supplementary Summer - 2024

**Course: B.Tech.****Branch : Computer and Allied****Semester : IV****Subject Code & Name: BTBSC404 Probability and Statistics****Max Marks: 60****Date: 20/06/2024****Duration: 3.00 Hr.****Instructions to the Students:**

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

(Level/CO)      Marks

**Q. 1 Solve Any Two of the following.****C0 1**

- A) State and prove Multiplication theorem of Probability. 6
- B) An urn contains 8 white and 3 red balls. If two balls are drawn at random, find the probability that 6  
(i) Both are white (ii) both are red (ii) one is of each colour
- C) In a bolt factory, machines A,B,C manufacture respectively 25%, 35% and 6  
40% of the total. Of their total output 5, 4, 2 per cent are known to be defective bolts. A bolt is drawn at random from the product and is found to be defective.  
What are the probabilities that it was manufactured by  
(I) Machine A (II) Machine B or C

**Q.2 Solve Any Two of the following.****CO 2**

- A) Find the Mean, Variance and Standard Deviation of the discrete random variable x whose probability distribution is given as 6

X	1	2	3	4	5
P(x)	0.1	0.1	0.3	0.3	0.2

- B) A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson variate with mean 1.5. Calculate the proportion of the days on which 6  
(i) Neither Car is used (ii) Some Demand is refused.

- C) The hourly wages of 1,000 workmen are normally distributed around a mean of Rs.70 and with a standard deviation of Rs.5. Estimate the number of workers whose hourly wages will be: 6

i) Between Rs. 69 and Rs. 72 ii) more than Rs. 75 iii) Less than Rs. 63

[ (Area between Z=0 and Z=0.4)=0.1554, (Area between Z=0 and

Z=0.2)=0.0793, (Area between Z=0 and Z=1)=0.3413

(Area between Z=0 and Z=1.4)=0.4192]

**Q. 3 Solve Any Two of the following.****CO 3**

- A) From the following data calculate Karl Pearson's correlation coefficient. 6

x	6	2	10	4	8
y	9	11	5	8	7

Also find standard error (S.E) and probable error (P.E).

- B) From the following data calculate rank correlation coefficient. 6

x	32	35	39	60	43	37	43	49	10	20
y	40	30	70	20	30	50	72	60	45	25

- C) Prove that Correlation Coefficient r is independent of change of origin and scale. 6

**Q.4 Solve Any Two of the following.****CO 4**

- A) Obtain the equation of line of Regression of y on x and x on y for the following data. 6

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

Also find the value of y when x = 6.2

- B) The lines of regression of a bivariate population are  $8x-10y+66=0$  and  $40x-18y=214$ . The variance of x is 9. Find (i) Mean values of x and y (ii) Correlation coefficient between x and y (iii) Standard deviation of x and y. 6

- C) At the time of estimation of the regression equations of the two variables x and y ,the following results were obtained:  $\bar{x} = 90$ ;  $\bar{y} = 70$ ;  $n = 10$ ;  $\sum x^2 = 6360$  ;  $\sum y^2 = 2860$  ,  $\sum xy = 3900$ , where x and y are the deviations from the respective means. Obtain the equations. 6

**Q. 5 Solve Any Two of the following.****CO 5**

- A) In a random sample of 400 persons from a large population, 120 are females. Can it be said that males and females are in the ratio 5:3 in the population? Use 1% level of significance. 6

- B) It is claimed that a random sample of 100 tyres with a mean life of 15269 kms is drawn from a population of tyres which has a mean life of 15200 kms and a standard deviation of 1248 kms. Test validity of claim at 5% level of significance. 6

- C) In two large populations there are 30% and 25% respectively of fair haired peoples. Is this difference likely to be hidden in sample of 1200 and 900 respectively from the two populations? Use 5% level of significance. 6



**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Supplementary Winter-2023**

**Course: B. Tech. Branch :Computer Engineering and Allied**

**Semester :IV**

**Subject Code & Name: BTBSC404 Probability &Statistics**

**Max Marks: 60**

**Date:23/01/24**

**Duration: 3 Hr.**

**Instructions to the Students:**

1. All the questions are compulsory.
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4. Assume suitable data wherever necessary and mention it clearly.

(Level  
/CO) Marks

**Q. 1 Solve Any Two of the following.**

**12**

**A)** There are 3 true coins and 1 false coin with ‘head’ on both sides. A coin is chosen at random and tossed 4 times. If ‘head’ occurs all the 4 times, what is the probability that the false coin has been chosen and used?

**CO-2** **6**

**B)** If A and B are any 2 events such that  $P(A) = \frac{3}{4}$  and  $P(B) = \frac{5}{8}$ . Prove that  

$$\frac{3}{8} \leq P(A \cap B) \leq \frac{5}{8}$$

**CO-2** **6**

**C)** A box contains 5 green pencils and 7 yellow pencils. Two pencils are chosen at random from the box without replacement. What is the probability that both are yellow?

**CO-2** **6**

**Q.2 Solve Any Two of the following.**

**12**

**A)** Find the value of  $k$  , if the following function is a probability density function.

$$f(x) = \begin{cases} k(x-1)^3 & 1 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

**CO-1** **6**

**B)** A firm has two cars which it hires out day by day. The number of demands of a car each day is distributed as a Poisson variate of mean 1.5. Calculate the probable number of days in a year on which (i) neither car is in demand (ii) a demand is refused.

**CO-1** **6**

**C)** Five coins are tossed 100 times and the following results were obtained

No. of heads	0	1	2	3	4	5
frequency	10	20	30	15	15	10

Fit a Binomial distribution.

**CO-1** **6**

**Q. 3 Solve Any Two of the following.**

**12**

**A)** Calculate Karl Pearson’s co-efficients of correlation from the following data

**CO-3** **6**

x	28	45	40	38	35	33	40	32	36	33
y	23	34	33	34	30	26	28	31	36	35

<b>B)</b>	Calculate the value of rank correlation coefficient from the following data regarding marks of six students in statistics and accountancy in a test	<b>CO-4</b>	<b>6</b>																		
	<table border="1"> <tr> <td>Marks in statistics</td><td>40</td><td>42</td><td>45</td><td>35</td><td>36</td><td>39</td></tr> <tr> <td>Marks in accountancy</td><td>46</td><td>43</td><td>44</td><td>39</td><td>40</td><td>43</td></tr> </table>	Marks in statistics	40	42	45	35	36	39	Marks in accountancy	46	43	44	39	40	43						
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<b>C)</b>	Prove that limits of correlation coefficients are lies between $-1 \leq r \leq 1$ .	<b>CO-4</b>	<b>6</b>																		
<b>Q.4</b>	<b>Solve Any Two of the following.</b>		<b>12</b>																		
<b>A)</b>	Find the equations of the lines of regression on (i) Y on X and (ii) X on Y and also a co-efficient of correlation from the following table.	<b>CO-3</b>	<b>6</b>																		
	<table border="1"> <tr> <td>X</td><td>62</td><td>64</td><td>65</td><td>69</td><td>70</td><td>71</td><td>72</td><td>74</td></tr> <tr> <td>Y</td><td>126</td><td>125</td><td>139</td><td>145</td><td>165</td><td>152</td><td>180</td><td>208</td></tr> </table>	X	62	64	65	69	70	71	72	74	Y	126	125	139	145	165	152	180	208		
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Y	126	125	139	145	165	152	180	208													
<b>B)</b>	The equations to the two lines of regression are $6y = 5x + 90$ and $15x = 8y + 130$ . Find (i) the means of $x$ and $y$ , (ii) the coefficient of correlation , (iii) if variance of $x = 16$ , find also the standard deviation of $y$ .	<b>CO-3</b>	<b>6</b>																		
<b>C)</b>	If the coefficient of correlation between two variables $x$ and $y$ is 0.5 and the acute angle between their lines of regression is $\tan^{-1} \left( \frac{3}{5} \right)$ . Prove that $\sigma_x = \frac{1}{2} \sigma_y$ .	<b>CO-3</b>	<b>6</b>																		
<b>Q. 5</b>	<b>Solve Any Two of the following.</b>		<b>12</b>																		
<b>A)</b>	A manufacturer claims that only 4% of his products supplied by him are defective. A random sample of 600 products contained 36 defectives. Test the claim of the manufacturer.	<b>CO-4</b>	<b>6</b>																		
<b>B)</b>	A machine produced 16 defectives articles in a batch of 500. After overhauling it produced 3 defectives in a batch of 100. Has the machine improved?	<b>CO-4</b>	<b>6</b>																		
<b>C)</b>	A soap manufacturing company was distributing a particular brand of soap through a large number of retail soap. Before a heavy advertisement campaign, the mean sale per week per shop was 140 dozens. After the campaign a sample of 26 shops was taken and the mean sale was found to be 147 dozens with standard deviation of 16. Can you consider the advertisement effective?	<b>CO-5</b>	<b>6</b>																		
	<b>*** End ***</b>																				



**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

Regular & Supplementary Summer - 2024

## **Course: B.Tech.**

**Branch :** Computer and Allied

Semester : IV

**Subject Code & Name: BTBSC404 Probability and Statistics**

Max Marks: 60

Date: 20/06/2024

**Duration: 3.00 Hr.**

## **Instructions to the Students:**

1. All the questions are compulsory.
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C) In a bolt factory, machines A,B,C manufacture respectively 25%, 35% and 40% of the total. Of their total output 5, 4, 2 per cent are known to be defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by (I) Machine A (II) Machine B or C		6												
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**Q. 3 Solve Any Two of the following.****CO 3**

- A) From the following data calculate Karl Pearson's correlation coefficient. 6

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y	9	11	5	8	7

Also find standard error (S.E) and probable error (P.E).

- B) From the following data calculate rank correlation coefficient. 6

x	32	35	39	60	43	37	43	49	10	20
y	40	30	70	20	30	50	72	60	45	25

- C) Prove that Correlation Coefficient  $r$  is independent of change of origin and scale. 6

**Q.4 Solve Any Two of the following.****CO 4**

- A) Obtain the equation of line of Regression of  $y$  on  $x$  and  $x$  on  $y$  for the following data. 6

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

Also find the value of  $y$  when  $x = 6.2$

- B) The lines of regression of a bivariate population are  $8x - 10y + 66 = 0$  and  $40x - 18y = 214$ . The variance of  $x$  is 9. Find (i) Mean values of  $x$  and  $y$  (ii) Correlation coefficient between  $x$  and  $y$  (iii) Standard deviation of  $x$  and  $y$ . 6

- C) At the time of estimation of the regression equations of the two variables  $x$  and  $y$ , the following results were obtained:  $\bar{x} = 90$ ;  $\bar{y} = 70$ ;  $n = 10$ ;  $\sum x^2 = 6360$ ;  $\sum y^2 = 2860$ ,  $\sum xy = 3900$ , where  $x$  and  $y$  are the deviations from the respective means. Obtain the equations. 6

**Q. 5 Solve Any Two of the following.****CO 5**

- A) In a random sample of 400 persons from a large population, 120 are females. Can it be said that males and females are in the ratio 5:3 in the population? Use 1% level of significance. 6

- B) It is claimed that a random sample of 100 tyres with a mean life of 15269 kms is drawn from a population of tyres which has a mean life of 15200 kms and a standard deviation of 1248 kms. Test validity of claim at 5% level of significance. 6

- C) In two large populations there are 30% and 25% respectively of fair haired peoples. Is this difference likely to be hidden in sample of 1200 and 900 respectively from the two populations? Use 5% level of significance. 6

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,  
LONERE-RAIGAD-402103**

**Summer Semester Examination, 2022**

**B.Tech. Computer Engineering /CSE/ CSE(AI&ML).**

**Semester: IV    Max. Marks: 60**

**Subject: Probability Theory & Random Processes/Probability  
and Statistics [BTBS404]**

**Date: 24/08/2022**

**Time: 3.45 Hrs**

**Instructions to the Student:**

1. Each question carries 12 marks
2. All Questions are compulsory
3. Illustrate your answers with neat sketches diagram etc. wherever necessary.
4. If some pare or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Marks

Que: 1 Attempt any TWO of the following questions. [12]

A] i) What is the chance that a non-leap year should have fifty three Sundays?

ii) Urn A contains 5 red and 3 white memory chips; the urn B contains 2 red and 6 white memory chips. If a chip is drawn from each box what is the probability that they are both of the same colour?

B] A committee of 4 persons is to be appointed from 3 officers of the production department, 4 officers of the purchase department, 2 officers of the sales department and 1 chartered accountant. Find the probability of the committee in the following manner:

- i) There must be one from each category.
- ii) It should have at least one from the purchase department.
- iii) The chartered accountant must be in the committee

C] In a certain college 25% of boys and 10% of girls are studying mathematics. The girls constitute 60% of the students. If a student is selected at random and is found to be studying mathematics, find the probability that the student is a (i) girl and (ii) a boy.

Que: 2 Attempt any TWO of the following questions. [12]

A] i) A continuous random variable has the probability density function  $f(x)f(x)$  as

$$f(x) = \begin{cases} ke^{-x}, & x > 0 \\ 0, & elsewhere \end{cases}$$

Determine the constant  $k$ .

ii) Obtain the probability distribution of  $X$ , the number of heads in three tosses of a coin. Also find the expected number of heads appearing when a fair coin is tossed three times.

B] Fit a Binomial distribution to the following observation:

x	0	1	2	3	4	5
f	2	14	20	34	22	8

C] Sacks of sugar packed by an atomic loader having an average weight of 100 kg with standard deviation 0.250 kg. Assuming normal distribution find chance of sack get weighing less than 99.5 kg. (Given:  $A(2) = 0.4772$   $A(2) = 0.4772$ )

Que: 3 Attempt the following questions.

[12]

A] From the following data, calculate the rank correlation coefficient by Karl Pearson's method

x	6	2	10	4	8
y	9	11	?	8	7

Arithmetic means of X and Y series are 6 and 8 respectively.

B] From the following table, calculate the coefficient of correlation by Karl Pearson's method

x	48	33	40	9	16	16	65	24	16	57
y	13	13	24	6	15	4	20	9	6	19

Que: 4 Attempt the following questions.

[12]

A] Obtain the least square regression line of  $y$  on  $x$  for the following data.

$x_i$	6	2	10	4	8
$y_i$	9	11	5	8	7

Also, obtain an estimate of  $y$  which should correspond on the average to  $\bar{x} = 5$ .  $\bar{x} = 5$ .

B] The equation of two lines are  $2x = 8 - 3y$   $2x = 8 - 3y$  and  $2y = 5 - x$   $2y = 5 - x$ . Find the mean values of  $x$  and  $y$ . Find the value of correlation coefficient.

Que: 5 Attempt the following questions.

[12]

A] i) A die was thrown 6000 times and a throw of 5 or 6 was obtained 3240 times. On the assumption of random throwing, do the data indicate an unbiased die?

ii) There are 30% and 25% respectively of fair-haired people in the two large populations. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations?

B] A full-time Ph.D. students received an average salary of \$12,837 according to U.S. Department of Education. The dean of graduate studies at a large state University feels that Ph.D. students in his state earn more than this. He surveys 44 randomly selected students and finds their average salary is \$14,445 with a standard deviation of \$150. With  $\alpha = 0.05$ , is the dean correct?

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Supplementary Winter Semester Examination – 2023**

**Course: B. Tech. Branch : Computer Science & Engineering Semester: IV**

**Subject Code & Name: Probability Theory and Random Processes (BTBS404)**

**Max Marks: 60**

**Date: 23-01-24**

**Duration: 3 Hr.**

**Instructions to the Students:**

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(Level/CO) Marks

**Q. 1 Solve Any Two of the following. 12**

A) A card is drawn from a well shuffled pack of playing cards. Find the probability that it is either a diamond or a king. Understand

B) In a random arrangement of the letters of the word “MATHEMATICS”. Find the Probability that all the vowels come together Understand

C) Derive equation of Bayes' Theorem Application

**Q.2 Solve Any Two of the following. 12**

A) Ten unbiased coin are tossed simultaneously. Find the probability of obtaining, Application  
i) exactly 6 heads ii) No head

B) A continuous random variable has probability density function Evaluation  
 $f(x) = 6(x - x^2)$  where  $0 \leq x \leq 1$ .  
Find mean, variance, median.

C) A die is tossed twice. Getting ‘an odd number’ is termed as success. Find the Understand probability distribution of the number of successes.

**Q. 3 Solve Any Two of the following. 12**

A) Calculate probable error. If the coefficient of correlation is 0.92 and number of Application pairs of items are 25.

B) The ranks of some 16 students in Mathematics and Physics are as follows. Application  
Two numbers within brackets denote the ranks of the students in Mathematics and Physics:  
(1,1), (2,10), (3,3), (4,4), (5,5), (6,7), (7,2), (8,6), (9,8), (10,11), (11,15),  
(12,9), (13,14), (14,12), (15,16), (16,13).  
Calculate the rank correlation coefficient for the proficiencies of this group in Mathematics & Physics.

C) What is Correlation? Explain its types and causation. Understand

**Q.4 Solve Any Two of the following.**

12

- A) Obtain the angle between the two lines of regression.
- B) From the following data of the age of husband and age of wife, find two regression lines and calculate the husband's age when wife's age is 16. Analysis

Husband age	36	23	27	28	28	29	30	31	33	35
Wife age	29	18	20	22	27	21	29	27	29	28

- C) If  $\bar{x} = 8.2$ ;  $\bar{y} = 12.4$ ;  $\sigma_x = 6.2$ ;  $\sigma_y = 20$ ;  $r(x,y) = 0.9$ , find the lines of regression. Estimate the value of  $x$  for  $y = 10$  and estimate  $y$  for  $x = 10$ . Application

**Q. 5 Solve Any Two of the following.**

12

- A) A random sample of size 36 is taken from a normal population with known variance  $\sigma^2 = 25$ . If the mean of the samples is  $\bar{x} = 42.6$  test the null hypothesis  $\mu = 45$  against the alternative hypothesis  $\mu < 45$  with  $\alpha = 0.05$  Application
- B) Explain Null Hypothesis and Alternative Hypothesis. Evaluation
- C) In a random sample of 340 students, 178 of the 210 females and 90 of the 130 males passed Statistics and Probability on their first take. Construct a 90% confidence interval for the population proportion of students who passed the subject. Application

\*\*\* End \*\*\*

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

Regular & Supplementary Summer - 2024

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- C) Prove that Correlation Coefficient  $r$  is independent of change of origin and scale. 6

**Q.4 Solve Any Two of the following.****CO 4**

- A) Obtain the equation of line of Regression of  $y$  on  $x$  and  $x$  on  $y$  for the following data. 6

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

Also find the value of  $y$  when  $x = 6.2$

- B) The lines of regression of a bivariate population are  $8x - 10y + 66 = 0$  and  $40x - 18y = 214$ . The variance of  $x$  is 9. Find (i) Mean values of  $x$  and  $y$  (ii) Correlation coefficient between  $x$  and  $y$  (iii) Standard deviation of  $x$  and  $y$ . 6

- C) At the time of estimation of the regression equations of the two variables  $x$  and  $y$ , the following results were obtained:  $\bar{x} = 90$ ;  $\bar{y} = 70$ ;  $n = 10$ ;  $\sum x^2 = 6360$ ;  $\sum y^2 = 2860$ ,  $\sum xy = 3900$ , where  $x$  and  $y$  are the deviations from the respective means. Obtain the equations. 6

**Q. 5 Solve Any Two of the following.****CO 5**

- A) In a random sample of 400 persons from a large population, 120 are females. Can it be said that males and females are in the ratio 5:3 in the population? Use 1% level of significance. 6

- B) It is claimed that a random sample of 100 tyres with a mean life of 15269 kms is drawn from a population of tyres which has a mean life of 15200 kms and a standard deviation of 1248 kms. Test validity of claim at 5% level of significance. 6

- C) In two large populations there are 30% and 25% respectively of fair haired peoples. Is this difference likely to be hidden in sample of 1200 and 900 respectively from the two populations? Use 5% level of significance. 6

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Summer Examination - 2023**

**Course: SY B.Tech.**

**Branch : Computer Science and Allied Engineering**

**Semester**

**:IV**

**Subject Code & Name: Probability and Statistics**

**BTBSC404**

**Duration: 3 Hrs.**

**Max Marks: 60**

**Date: 26/07/2023**

**Instructions to the Students:**

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
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4. Assume suitable data wherever necessary and mention it clearly.

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B)	If A & B are two possible outcomes of a random experiment such that $P(\bar{A}) = 0.6$ , $P(A \cup B) = 0.7$ and $P(B) = k$ , then find value of "k" if (i) A & B are mutually exclusive      (ii) A & B are independent		<b>6</b>														
C)	The factory $F_1$ produces 1000 articles, 20 of them being defective; the factory $F_2$ produces 4000 articles, 40 of them being defective and the $F_3$ produces 5000 articles, 50 of them being defective. If one article is chosen from all these articles put in one stockpile and is found to be defective, find the probability that it is from the factory $F_1$ .		<b>6</b>														
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C)	In a sample of 1000 students, the mean and standard deviation of marks obtained by the students in a certain test are 14 and 2.5. Assuming the distribution to be normal find the number of students getting marks (i) between 12 and 15, (ii) above 18, (iii) below 8 [Given: For a S.N.V. z area between $z = 0$ to $z = 0.4$ is 0.1554, between $z = 0$ to $z = 0.8$ is 0.2881, that between $z = 0$ to $z = 1.6$ is 0.4452, between $z = 0$ to $z = 2.4$ is 0.4918]		<b>6</b>														
<b>Q. 3</b>	<b>Solve Any Two of the following.</b>	<b>CO3</b>	<b>12</b>														

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**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Summer Examination - 2023**

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**Semester**

**:IV**

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**BTBSC404**

**Max Marks: 60**

**Date: 26/07/2023**

**Duration: 3 Hrs.**

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**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE****Supplementary Semester Examination – January 2023****Course: B. Tech.****Branch : CE / CSE / CS****Semester : IV****Subject Code & Name: Probability & Statistics [BTCOC402]****Max Marks: 60****Date:****Duration: 3 Hrs.****Instructions to the Students:**

1. All the questions are compulsory.
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(Level/CO) Marks

**Q. 1 Solve Any Two of the following.****[12]****A)** Four cards are drawn at random from a pack of 52 cards. Find the probability that, **Understand**

- (i) They are a king, a queen, a jack and an ace.
- (ii) There is one card of each suit.
- (iii) There are two cards of Clubs and two cards of diamonds.

**B)** If events A and B are independent then the events**Understand**

- (i) A and  $\bar{B}$  are independent
- (ii)  $\bar{A}$  and B are independent

**C)** In a bolt factory, machines A, B, C manufacture respectively 25%, 35%, and 40% of the total. Of their output 5, 4, 2 per cent are known to be defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by

- (i) Machine A,
- (ii) Machine B or C

**Q.2 Attempt the following questions.****[12]****A)** (i) Two dice are rolled at random. Obtain the probability distribution of sum of the numbers on them. **Understand**

- (ii) Three cards are drawn at random successively, without replacement from a well shuffled pack of cards. Obtain the probability distribution of the number of face cards (jack, queen, king, and ace).

**B)** Write the proof for the following: **Evaluate**

$$\text{Var}(ax + by) = a^2 \text{Var}(x) + b^2 \text{Var}(y) + 2ab \text{Cov}(x, y)$$

**Q. 3 Solve Any Two of the following.****[12]****A)** Write the proof to find mean and variance of the Binomial Distribution. **Evaluate****B)** If 5% of the electric bulbs manufactured by a company are defective, use Poisson distribution to find the probability that in a sample of 100 bulbs

- (i) none is defective
- (ii) 5 bulbs will be defective. ( $e^{-5} = 0.007$ )

- C)** The hourly wages of 1000 workmen are normally distributed around a mean of **Understand** Rs. 70 and with a standard deviation of Rs. 5. Estimate the number of workers whose hourly wages will be:
- between Rs. 69 and Rs. 72
  - more than Rs. 75
  - less than Rs. 63

**Q.4 Solve the following questions.**

**[12]**

- A)** Calculate Karl Pearson's coefficient of correlation between expenditure on **Understand** advertising and sales from the data given below:

Advertising expenses	39	65	62	90	82	75	25	98	36	78
Sales	47	53	58	86	62	68	60	91	51	84

- B)** Ten competitors in a beauty contest are ranked by three judges in the following **Understand** order :

1 <sup>st</sup> Judge:	1	6	5	10	3	2	4	9	7	8
2 <sup>nd</sup> Judge:	3	5	8	4	7	10	2	1	6	9
3 <sup>rd</sup> Judge:	6	4	9	8	1	2	3	10	5	7

**Q. 5 Solve Any Two of the following.**

**[12]**

- A)** The data of marks in the Statistics and Economics are given in the table. Find the **Understand** following:

- The two regression coefficients
- The two regression equations
- The coefficient of correlation between the marks in Economics and Statistics.

Marks in Economics	25	28	35	32	31	36	29	38	34	32
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Marks in Statistics	43	46	49	41	36	32	31	30	33	39
---------------------	----	----	----	----	----	----	----	----	----	----

- B)** If the two lines of regression are:

$$4x - 5y + 30 = 0 \quad \text{and} \quad 20x - 9y - 107 = 0$$

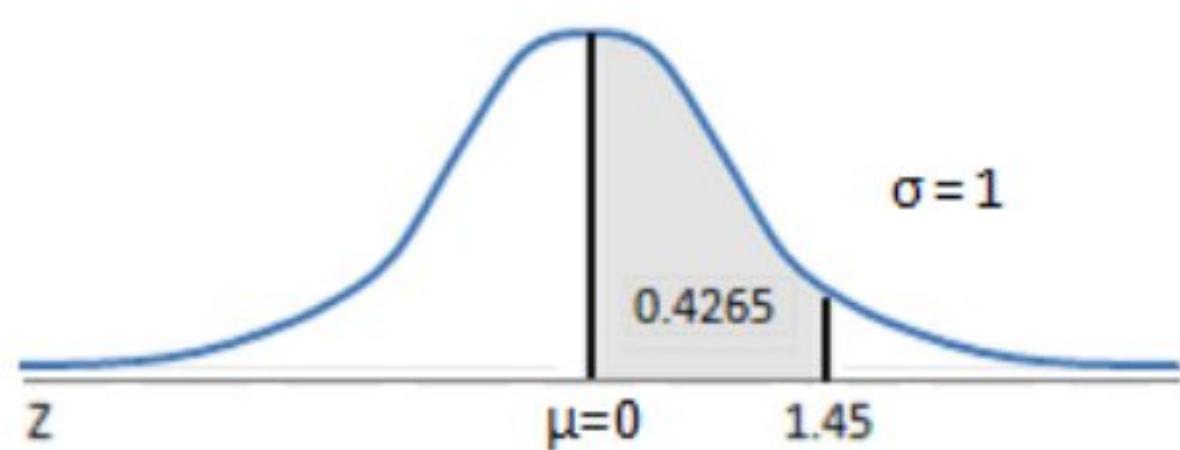
are line of regressions  $x$  on  $y$ , and  $y$  on  $x$  respectively. Find  $r_{xy}$  and  $\sigma_y$  when  $\sigma_x = 3$ .

- C)** A packaging device is set to fill detergent powder packets with a mean weight of **Understand** 5 kg, with a standard deviation of 0.31 kg. The weight of packets can be assumed to be normally distributed. The weight of packets is known to drift upwards over a period of time due to machine fault, which is not tolerable. A random sample of 100 packets is taken and weighed. The sample has mean weight of 5.03 kg. Can we conclude that the mean weight produced by the machine has increased? Use a 5 per cent level of significance. (Given  $Z_\alpha = 1.645$ )

## Areas Under the One-Tailed Standard Normal Curve

This table provides the area between the mean and some Z score.

For example, when Z score = 1.45  
the area = 0.4265.



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

\*\*\* End \*\*\*