



University of Engineering & Management, Kolkata

End Semester Examination, November - December, 2022

Programme Name: B.Tech in CSE/CSE(AIML)/CSE(IOT)/CSBS

Semester: 3rd

Course Name: Mathematics - III

Course Code: BSCE301

Time: 3 Hours

Full Marks: 100

Group - A

Answer 10 questions. Each question carries 2 marks. (2 × 10)

- 1.A. Is the following function a p.d.f. of random variable X? 2,CO2,Understand

$$f(x) = \begin{cases} x, & 0 < x \leq 1 \\ (2-x), & 1 < x \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

Explain.

Or

- 1.B. Regression Coefficient of X and Y is 3 and correlation coefficient is -0.9. Is the statement true? Justify your answer. 2,CO2,Understand

- 2.A. For what value of r the regression coefficient will be zero. 2,CO2,Understand

Or

- 2.B. A researcher has a large number of data pairs (age, height) of humans from birth to 70 years. He computes a correlation coefficient. Would you expect it to be positive or negative? Why? 2,CO2,Understand

- 3.A. Describe Critical Region in Hypothesis Testing. 2,CO2,Understand

Or

- 3.B. Explain sampling with replacement and without replacement. 2,CO2,Understand

- 4.A. Explain the following terms : Population , Sample , Parameter , Statistics. 2,CO2,Understand

Or

- 4.B. For a group of 8 students , sum of squares of differences of ranks of two variables was found to be 50. What is the value of rank correlation coefficient? 2,CO2,Understand

- 5.A. If t be test statistic and (a,b) is the critical region at 4% level of significance, then find P(a≤t≤b). 2,CO2,Understand

Or

5.B. Describe concept of regression.

2,CO2,Understand

6.A. State the probability density function of Normal Distribution.

2,CO1,Remember

Or

6.B. State the probability mass function of Binomial Distribution.

2,CO1,Remember

7.A. The mean weight of 150 students (boys & girls) in a class is 60kg. The mean weight of boy-students is 70kg. and that of girl-students is 55kg. Find the number of boys and girls in that class.

2,CO1,Remember

Or

7.B. How many outcomes can a Bernoulli's trial have?

2,CO1,Remember

8.A. Obtain \bar{x} and \bar{y} from the two regression lines $3x-5y=1$ and $4x-7y=3$

2,CO1,Remember

Or

8.B. State the probability density function of Exponential Distribution.

2,CO1,Remember

9.A. What do you mean by theoretical distribution? Name one discrete another continuous distribution.

2,CO1,Remember

9.B. Define Null Hypothesis.

2,CO1,Remember

10.A. Find the value of $E(X^2)$ when X follows $N(0,1)$.

2,CO1,Remember

Or

10.B. What is the probability of getting a sum 9 from two throws of a dice?

2,CO1,Remember

Group - B

Answer 8 questions. Each question carries 5 marks. (5×8)

11.A. If a person gets Rs. $(2x+5)$ where x denotes the number appearing when a balanced die is rolled once, then how much money can he expect in the long run?

5,CO5,Evaluate

11.B. For a binomial distribution mean and s.d are respectively 4 and . Calculate the probability of getting a non zero value from this distribution.

5,CO5,Evaluate

12.A. The incidence of occupational disease in an industry is such that the workers have a 10% chance of suffering from it. What

5,CO5,Evaluate

is the probability that out of six workers, 3 or more will suffer from the disease?

Or

- 12.B. Find the probability that at most 5 defective pen will be found in a box of 200 pen if experience shows that 2% of such pen are defective.

5,CO5,Evalu

- 13.A. A discrete r.v. X has mean 6 and variance 2. Assuming the distribution is Binomial Distribution find the probability of $(4 < X < 8)$.

5,CO4,Analy

Or

- 13.B. A shop sells five pieces of shirt every day, then what is the probability of selling three shirts today?

5,CO4,Analy

- 14.A. A continuous random variable X is distributed over the interval $[0,1]$ with p.d.f. $f(x) = ax^2 + b$ where a and b are constants. If the mean of X is 0.25 find the values of a and b.

5,CO4,Analy

Or

- 14.B. If x is a Poisson variate such that $P(X=1)=0.2$ and $P(X=2)=0.2$, find $P(X=0)$.

5,CO4,Analy

- 15.A. Given that X and Y have the joint pdf $f(x,y) = \frac{1}{8}(6-x-y); 0 \leq x \leq 2, 2 \leq y \leq 4$. Find $P(X<1, Y<3)$.

5,CO4,Analy

Or

- 15.B. Find k so that $f(x) = kx^2y^2, 1 \leq x \leq y \leq 2$ will be a joint probability density function.

5,CO4,Analy

- 16.A. If X is normal variate with mean 12 & standard deviation 4, find $P(X \geq 20)$.

5,CO3,App

Or

- 16.B. A random variable X is exponentially distributed with p.d.f $f(x) = \frac{1}{40}e^{-\frac{x}{40}}, x > 0$. Find $P(20 < X < 30)$

5,CO3,Ap

- 17.A. A random sample of 16 pigs showed an average increase of weight of 20 kg when a new diet is administered. Assuming that the increase in weight is normal with variance 4, find 95% confidence interval for average increase in weight due to this new diet. Use the required value from the table provided.

5,CO6,Cre

Or

- 17.B. A sample of 11 steel rods produced by a rod company had an average breaking strength of 3.92 unit with s.d. 0.61. On the basis of this sample find 95% confidence interval of the

5,CO6,Cre

breaking strength of all rods, assumed normal. Use the required value from the table provided.

- 18.A. A machine is known to produce 10% defective items. If a random sample of 20 items is taken what is the probability of getting exactly 3 defectives.

5,CO5,Evalu

- 18.B. A radioactive source emits on the average 2.5 particles per seconds. Calculate the probability that 2 or more particles will be emitted in an interval of 4 seconds.

Or

5,CO5,Evalu

Group - C

Answer 4 questions. Each question carries 10 marks. (10 × 4)

- 19.A. An automobile tyre manufacturer claims that the average life of a particular grade of tyre is more than 20000 km when used under normal conditions. A random sample of 16 tyres was tested and a mean and standard deviation of 22000 km and 5000 km, respectively were computed. Assuming the life of the tyres in km to be approximately normally distributed, decide whether the manufacturer's claim is valid.

10,CO6,Crea

Or

- 19.B. In a simple random sample of 600 men taken from a big city, 400 are found to be smokers. In another simple random sample of 900 men taken from another city 450 smokers. Do the data indicate that there is a significant difference in the habit of smoking in the two cities?

10,CO6,Creat

- 20.A. A sample of 11 rats from a central population had an average blood viscosity of 3.92 with s.d. 0.61. On the basis of this sample, establish 95% limits of the mean blood viscosity of control population. Given $P(t>2.228)=0.025$ for 10 d.f.

10,CO5,Evaluat

Or

- 20.B. The average marks in CBNST of a sample of 100 students was 51 with a S.D. of 6 marks. Could this have been a random sample from a population with average marks 50?

10,CO5,Evaluat

- 21.A. Consider the following set of points: $\{(-2, -1), (1, 1), (3, 2)\}$. Find the least square regression line for the given data points.

10,CO3,Apply

10,CO3,Apply

- 21.B. If you buy a lottery ticket in 50 lotteries, in each of which your chance of winning a prize is $1/100$. What is the probability that you will win a prize exactly once? What is the probability that you will not win a prize?

- 22.A. The heights of six randomly chosen sailors are in inches 63, 65, 68, 69, 71, and 72. Those of the randomly chosen soldiers are 61, 62, 65, 69, 69, 70, 71, 72, 73. Discuss in the light that the data throw that the soldiers are on the average, taller than the sailors.

Or

- 22.B. Mice with an average lifespan of 32 months will live up to 40 months when fed by a certain nutrition food. If 64 mice fed on this diet have an average lifespan of 38 months and standard deviation of 5.8 months, is there any reason to believe that average lifespan is less than 40 months. Use 5% level of significance. Given that the significant value of Z at 5% level of significance is 1.645

10,CO6,Create
