QP Code: RS20MSC169 | Reg. No | | | | | | | | | | | AR 20

GIET UNIVERSITY, GUNUPUR – 765022

M. Sc. (Second Semester) Examinations, September – 2021

20MTPC205 - MATHEMATICAL STATISTICS

(Mathematics)

Time: 2 hrs | Maximum: 50 Marks

(The figures in the right hand margin indicate marks.)

PART – A

Q.1. Answer ***ALL*** questions **(2 x 10 = 20 Marks)**

a. Prove that $P(A' \cap B') = 1 + P(A \cap B) - P(A) - P(B)$

b. Suppose that we have a fuse box containing 20 fuses, of which 5 are defective. If 2 fuses are selected at random and removed from the box in succession without replacing the first, what is the probability that both fuses are defective?

c. Consider the density function $f(x) = k\sqrt{x}$, $0 < x < 1$ 0 otherwise then find the value of k.

d. The probability that a patient recovers from a delicate heart operation is 0.9. What is the probability that exactly 5 of the next 7 patients having this operation survive?

e. On average a certain intersection results in 3 traffic accidents per month. What is the probability that for any given month at this intersection exactly 5 accidents will occur?

f. Given a random variable X having a normal distribution with $\mu = 50$ and $\sigma = 10$ find the probability that X assumes a value between 45 and 62.

g. The joint density function of the random variable X and Y is $f(x, y) = 6x,\ 0 < x < 1,\ 0 < y < 1 - x$ find Marginal density of X.

h. Derive mean of Poisson distribution.

i. Derive Variance of Discrete uniform distribution.

j. Define Type-I and Type-II error.

PART – B (6 x 5 = 30 Marks)

Answer ***ANY FIVE*** the questions — Marks

2 State and prove Chebychev's inequality. (6)

3 In a certain assembly plant, three machines, B_1, B_2, B_3, make 30%,45% and 25% respectively, of the products. It is known from the past experience that 2%,3% and 2% of the products made by each machine, respectively, are defective. Now suppose that a finished product is randomly selected. What is the probability that it is defective? (6)

4 If X_1 and X_2 be two continuous random variables with joint probability distribution $f(x_1, x_2) = 4x_1x_2, \quad 0 < x_1 < 1, \ 0 < x_2 < 1$. Find the joint probability distribution of $Y = X_1^2$ and $Y_2 = X_1X_2$ (6)

5 Find maximum likely hood estimator for variance of Normal distribution. (6)

6 The average zinc concentration recovered from a sample of zinc measurements in 36 different locations is found to be 2.6 grams per milliliter. Find 99% confidence interval for the mean zinc concentration in the river. Assume that the population standard deviation is 0.3. (6)

7 A random sample of 100 recorded deaths in the US during the past year showed an average life span 71.8 years. Assuming a population standard deviation of 8.9 years. Does this seem to indicate that the mean life span today is greater than 70 years? Use a 0.05 level of significance. (6)

8 State and prove central limit theorem. (6)

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