QP Code: RD19MSC085 Reg. No | | | | | | | | | | AR 18

GIET UNIVERSITY, GUNUPUR – 765022

M. Sc(Third Semester) Examinations, December' 2020

MTOE 308/AE 307 – MATHEMATICAL STATISTICS – II

(Mathematics)

Time: 2hrs Maximum: 50 Marks

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

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

a. Find the mean of uniform distribution.

b. Define exponential distribution.

c. Let (x, y) have a joint probability function $f_{x,y} = 2 \quad 0 < x < y < 1$. Find the marginal probability distribution

d. If X,Y are independent random variables then prove that $E[XY] = E(X)E(Y)$.

e. Define iid random variable.

f. Write the conditions for orthogonality of two random variables.

g. If X_1 is a binomial random variable with n=3 and p=1/2 then find $M_{X_1}(t)$.

h. Let X be a continuous random variable with pdf

$$f(x) = 3(1-x)^2 for\ 0 < x < 1. \text{ What is the pdfof} Y = (1-X)^3\ ?$$

i. Write the difference between multiple & partial correlation.

j. Write the hierarchy of convergence.

PART – B **(6 x 5 = 30 Marks)**

<u>Answer ***ANY FIVE*** questions</u> Marks

2. Find the m.g.f of gamma distribution. Hence find the mean and variance. (6)

3. For a beta distribution with density $f(x) = \frac{1}{B(p,q)}(1-x)^{p-1}x^{q-1}, 0 < x < 1, p > 0, q > 0.$ Verify that the harmonic mean is less than the arithmetic mean. (6)

4. Let X,Y be the jointly continuous random variables with joint PDF (6)

$$f_{XY}(x, y) = \begin{cases} x + cy^2\ , & 0 \le x \le 1, \quad 0 \le y \le 1 \\ 0 & Otherwise. \end{cases}$$

   (i) Find the constant C.

   (ii) Find $P(0 \le X \le \frac{1}{2}, 0 \le Y \le \frac{1}{2})$

5. Suppose a coin is tossed 3 times and let X_1 denotes the number of heads we get in three tosses. Also let a second coin is tossed two times and let X_2 denotes the number of heads we got in those two tosses. Let $Y = X_1 + X_2$ denotes the number of heads in five tosses. What is the probability distribution of Y. (6)

6. Find the expression for marginal pmf $P_x(x) and\ P_y(y)$. (6)

Consider the joint pmf of X,Y as follows.

Y→ $X\downarrow$	0	1	2
0	1/6	1/4	1/8
1	1/8	1/6	1/6

(a) Find $P(X = 0, Y \leq 1)$
(b) Find marginal PMFs of X,Y
(c) Find $P(Y = 1 | X = 0)$

7. Suppose X_1, X_2 are independent random variable with parameter $\lambda = 1$ so that , (6)

$$f_{X_1}(x_1) = e^{-x_1} \ , \ 0 < x_1 < \infty$$

$$f_{X_2}(x_2) = e^{-x_2} \ , \ 0 < x_2 < \infty$$

Using transformation $Y_1 = X_1 - X_2$ find the joint distribution of Y_1.

8. State and prove central limit theorem (6)

9. Let X & Y be two jointly continuous random variable with joint PDF, (6)

$$F_{x,y}(x,y) = \begin{cases} \frac{3}{2}x^2 + y, & 0 < x, y < 1 \\ 0, & otherwise \end{cases}$$

And the random vector 'U' be defined by $U = \binom{x}{y}$, find the correlation & covariance matrices of 'U'

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