Roll No…….. **Total No. of Printed Pages: 2**

Total No. of Questions: [11]

M.Sc. (Physics) (Semester – 3rd)

STATISTICAL METHODS

Subject Code: MMAT0-F91

Paper ID: [OE1220714]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It carries 16 marks. It consists of 4 questions of 4 marks each.
2. Section B consist of 4 questions of 8 marks each. The student has to attempt any 3 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(4 marks each)**

Q1. Fit a straight line to the following data

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

Q2. Find the distribution function of X, whose PDF is given by

$$f(X)=\begin{cases}2x, & 0\le x\le 1\\ 0, & otherwise\end{cases}$$

Q3. For any three events *A,B,C*, show that

$$P(A\cup B\,|\,C)=P(A\,|\,C)+P(B\,|\,C)-P(A\cap B\,|\,C)$$

Q4. What is the relationship between *t* and *F* statistics?

Section – B **(8 marks each)**

Q5. Calculate mean, median and mode for the following:

Intervals	90-100	100-110	110-120	120-130	130-140	140-150	150-160	160-170
Frequency	10	37	65	80	51	35	18	4

Q6. If X and Y are random variables taking real values, then $\left[E(XY)\right]^2 \le E(X)^2\,E(Y)^2$

Q7. State and prove Bayes' theorem.

Q8. Discuss the applications of *t* distribution for testing of significance of (i) single mean and (ii) difference between means.

Section – C **(10 marks each)**

Q9. The lines of regression are given by *X+9Y=7* and *Y+4X=17*. If $\sigma_X{}^2 = 18$

Find coefficient of correlation 'r', $\overline{X}, \overline{Y}, \sigma_Y$ and estimated value of X when $Y=10$, where symbols have usual meanings.

Q10. Let X and Y are two random variables having joint density function

$$f(x,y)=\begin{cases}\frac{1}{8}(6-x-y), & 0\le x\le 2,\ 2\le y\le 4\\ 0, & otherwise\end{cases}$$

(a)Find the marginal density functions of X and Y

(b) Find $P(X<1\cap Y<3), P(X+Y<3)$ and $P(X<1|Y<3)$

Q11. (a) A and B are two independent events. The probability that both A and B occur is 1/6 and the probability that neither of them occurs is 1/3. Find the probability of occurrence of A.

(b) Define Poisson distribution. Obtain its mean and variance. **(5+5)**