MIMS DC
2023

4798/3

FACULTY OF SCIENCE

B.Sc. (I Semester) Examination

STATISTICS

Paper I

(Descriptive statistics and probability)

Time : 3 *Hours*] [*Max. Marks* : 80

Section A – (Marks: 8 × 4 = 32)

Answer any **eight** *questions.*
(Short Answer Questions)

1. Explain primary and secondary data collection methods.
2. Define Mean, Median and Mode with a suitable formulas.
3. The first four moments of a distribution about the value 'S' of the variable are 2, 20, 40 and 50. Find the central moments.
4. Define the following terms with an example.:-
   (i) Random experiments (ii) Outcome
   (iii) Sample space (iv) Mutually exclusive events.
5. Define Axioms of probability and also mention applications of axioms in probability theory.
6. A problem in statistics is given to two students A and B. The probability that 'A' solves the problem is 1/2 and that of 'B' to solve it is 2/3. Find the probability that the problem is solved.
7. Define random variable and also discuss the types of random variables.
8. Explain Joint, Marginal and Conditional distributions.
9. A random variable X has the following probability function:

x	0	1	2	3	4	5	6	7	8
P(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

   (i) Determine the value of a.
   (ii) Find $P(x < 3)$, $P(x \geq 3)$, $P(0 < x < 5)$.

10. Define mathematical expectations of random variable X and also mention relation between moments and expectations.
11. Define moment generating function. State and prove additive property of moment generating function.

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12, A random variable X has the following probability distribution:

x	– 1	0	1	2
P(x)	1/3	1/6	1/6	1/3

Compute the mean and variance of the distribution.

Section B – (Marks: 4 × 12= 48)
(*Essay Type Questions*)
Answer **all** *questions.*

13. (a) Explain Skewness and Kurtosis with diagrams. Which of these characters are essential for a good data?

Or

(b) Define central and non-central moments and also derive the relation between them. What is the effect of change of origin and scale on central moments?

14. (a) State and prove addition theorem of probability for 'n' events.

Or

(b) Define conditional probability. State and prove Bayes' theorem also mention its merits.

15. (a) (i) Define probability mass function and probability density function.

(ii) Define distribution function of a randam variable x, also state and prove any two properties of it.

Or

(b) Let 'X' be a continuous r-v with p.d.f.

$$f(x)=\begin{cases} ax, & 0 \le x \le 1 \\ a, & 1 \le x \le 2 \\ -ax+3a, & 2 \le x \le 3 \\ 0, & \text{elsewhere} \end{cases}$$

(i) Determine the constant a

(ii) Compute $p(x \le 1.5)$.

16. (a) Define characteristic function. How it is more serviceable function than the m.g.f. If x is some r.v. with characteristic function $\phi_x(t)$ and $\mu'_r = E(x^r)$ exists then

prove that $\mu'_r = (-i)^r \left[\frac{d^r}{dt^r}\phi_x(t)\right]_{/t=0}$

Or

(b) State and prove Chebyshev's inequality and also write its uses and applications.