(6 pages) Reg. No. : ....

Code No. : 7373 **Sub. Code : ZMAM 25**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2023.

Second Semester

Mathematics – Core

RESEARCH METHODOLOGY AND STATISTICS

(For those who joined in July 2021-2022 onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. ________ is a summary of the essential elements of your research.
   (a) Abstract (b) Title page
   (c) Literature review (d) Bibliography

2. Which comes under supporting sections?
   (a) Abstract (b) Title page
   (c) Literature review (d) Bibliography

3. $F(\infty) =$ ________.
   (a) 0 (b) -1
   (c) 1 (d) ∞

4. Let X have the p.d.f. $f(x) = 2(1-x), 0 < x < 1$, zero, elsewhere Then $E(X) =$ ________.
   (a) 0 (b) $\frac{1}{3}$
   (c) 2 (d) -1

5. Write the value of $\Gamma(1)$
   (a) 1 (b) 2
   (c) 5 (d) 4

6. Estimate Standard Deviation of N(2, 25).
   (a) 25 (b) 2
   (c) 5 (d) 4

7. For a large degree of freedom, t-distribution tends to ________ distribution.
   (a) F (b) χ^2
   (c) normal (d) gamma

8. A function of one or more random variables that does not depend upon any unknown parameter is called
   (a) Sampling (b) Statistic
   (c) Population (d) Distribution

9. When the limiting distribution of a random variable is degenerate ,the random variable is said to Converge________
   (a) Stochastically (b) Infinity
   (c) 0 (d) 1

10. $Y = \frac{2X}{\beta}, \beta < 0$ and X is a gamma distribution following ________ distribution.
    (a) F (b) χ^2
    (c) normal (d) gamma

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Write a short note on Appendices.

    Or

    (b) How to format your references?

12. (a) Let X have the pdf $f(x) = \frac{x}{6}, x = 1, 2, 3, 0$ else where find $E(X^3)$.

    Or

    (b) Write the properties of distribution function.

13. (a) Let x be $N(2, 25)$. Find $\Pr(0 < X < 10)$.

    Or

    (b) Let X be $\chi^2(10)$, find $\Pr(3.25 \le X \le 20.5)$.

14. (a) Let X have the binomial p.d.f. $f(x) = \frac{3!}{x!(3-x)!}\left(\frac{2}{3}\right)^x\left(\frac{1}{3}\right)^{3-x}$. Find the p.d.f. $g(y)$ of the random variable $Y = X^2$.

    Or

    (b) Let X be a random variable of the continuous type, having p.d.f. $f(x) = 2x, 0 < x < 1$, zero, else where. Define the random variable $Y = 8X^3$ find the p.d.f. $g(y)$ of Y.

15. (a) Suppose X_n converges to X in distribution and Y_n converges in probability to 0. Then examine $X_n + Y_n$ converges to X in distribution.

Or

(b) Let Z_n be $\chi^2(n)$. Examine the limiting distribution of random variable $Y_n = \frac{Z_{n-n}}{\sqrt{2n}}$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) What is methodology and why is it important?

Or

(b) Discuss about Abstract.

17. (a) Let X be a random variable of the continuous type ,having p.d.f $f(x) = \frac{1}{2}(x+1), -1 < x < 1$, zero, elsewhere. Find the mean and variance.

Or

(b) Let X be a random variable of the continuous type, having p.d.f. $f(x) = \frac{1}{2}, -1 < x < 1$, zero, elsewhere. Define the random variable $Y = X^2$. Find the p.d.f. $g(y)$ of Y.

18. (a) Suppose that 10% the probability for a certain distribution that is $N(\mu, \sigma^2)$ is below 60 and that 5% is above 90. What are the values of μ and σ?

Or

(b) If the random.variable is X is $N(\mu, \sigma^2)$, then prove that the random variable $V = \frac{(X - \mu^2)}{\sigma^2}$ is $\chi^2(1)$.

19. (a) Explain about t-distribution.

Or

(b) Derive double exponential p.d.f.

20. (a) Examine the proof of the central limit theorem.

Or

(b) Let Y_n have a distribution that is $b(n, p)$. Examine the limiting distribution of binomial distribution when $p = \frac{\mu}{n}$.