

(7 pages)

Reg. No. :

Code No. : 7848

Sub. Code : PMAM 35

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2019.

Third Semester

Mathematics – Core

RESEARCH METHODOLOGY

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. List of abbreviations is given
 - (a) at the end of a research project
 - (b) at the references page
 - (c) at the starting of project
 - (d) None

2. The pages of preliminary sections
 - (a) should not be numbered
 - (b) should be numbered using Roman numerals
 - (c) should be numbered using Arabic numerals
 - (d) none
3. The _____ for research explains why you decided to embark on your research project?
 - (a) guide
 - (b) motivation
 - (c) problem
 - (d) title
4. Plagiarism means
 - (a) copying from other research work
 - (b) conclusion
 - (c) introduction
 - (d) a summary of the main problem
5. If the mgf of X is $M(t) = (1-2t)^{-8}$, then the distribution of X is
 - (a) $N(2, 8)$
 - (b) $N(8, 2)$
 - (c) $\chi^2(2)$
 - (d) $\chi^2(16)$



6. The mean of a beta distribution with parameters α and β is

- (a) $\frac{\alpha}{\alpha - \beta}$ (b) $\frac{\alpha - \beta}{\alpha}$
 (c) $\frac{\alpha}{\alpha + \beta}$ (d) $\frac{\alpha - \beta}{2\alpha}$

7. If $f(x) = \begin{cases} cx^4(1-x)^5, & 0 < x < 1, \\ 0, & \text{elsewhere} \end{cases}$ is a pdf then $c =$

- (a) 20
 (b) 495
 (c) 1260
 (d) 0.0412

8. If F has an F distribution then $\frac{1}{F}$ has

- (a) T distribution (b) Weibull distribution
 (c) F distribution (d) Cauchy distribution

9. If X_i 's are $n(\mu, \sigma^2)$ then \bar{X} is

- (a) $n(\mu, \sigma^2)$ (b) $n(\mu, \frac{\sigma^2}{n})$
 (c) $n(\mu, 0)$ (d) $n(\mu, \frac{\sigma^2}{n^2})$

10. The variance of $\frac{ns^2}{\sigma^2}$ is

- (a) $n - 1$ (b) $2(n - 1)$
 (c) $\frac{\sigma^2}{n}$ (d) $\frac{\sigma^2}{n - 1}$

PART B — (5 × 5 = 25 marks)

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

11. (a) Explain with examples 'The title page' of a research project.

Or

(b) Why is methodology important?

12. (a) What are the basic requirements of a research degree?

Or

(b) Write a note on 'Acknowledgements'.

13. (a) Find the mgf, mean and variance of gamma distribution.

Or

(b) If $N(x) = \int_{-\infty}^x \frac{1}{\sqrt{2\pi}} e^{-\frac{w^2}{2}} dw$, show that $N(-x) = 1 - N(x)$.



14. (a) If F has an F distribution with parameters r_1 and r_2 show that $y = \frac{1}{1 + \frac{r_1}{r_2} F}$ has a beta distribution.

Or

- (b) If X_1, X_2 denote a random sample of size two from a distribution that is $n(0, 1)$, find the pdf of $Y = X_1^2 + X_2^2$.
15. (a) If $X_i (1 \leq i \leq n)$ are stochastically independent random variables having the normal distributions $n(\mu_i, \sigma_i^2) (1 \leq i \leq n)$, show that $Y = \sum_{i=1}^n k_i x_i$, where k_i are constants, is normally distributed with mean $\sum_{i=1}^n k_i \mu_i$ and variance $\sum_{i=1}^n k_i^2 \sigma_i^2$.

Or

- (b) Find the pdf of $\frac{nS^2}{\sigma^2}$.

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PART C — (5 × 8 = 40 marks)

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

16. (a) Explain the differences between a dissertation and a thesis.

Or

- (b) Write an essay on 'choosing and using your supervisor'.

17. (a) Briefly explain the elements of Introduction.

Or

- (b) Write an essay on 'Literature Review'.

18. (a) Find the mgf, mean and variance of the normal distribution.

Or

- (b) Let X be $n(\mu, \sigma^2)$.

- (i) If $P(X < 89) = 0.90$ and $p(X < 94) = 0.95$, find μ and σ^2 .

- (ii) If $p(-b < \frac{X - \mu}{\sigma} < b) = 0.90$, find b .

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19. (a) Derive student's t distribution

$$f(t) = \frac{1(1 + \frac{t^2}{r})^{-\frac{r+1}{2}}}{\sqrt{r} B\left(\frac{r}{2}, \frac{1}{2}\right)}, -\infty < t < \infty.$$

Or

- (b) If X_1, X_2 are two independent $\chi^2(2)$ variables, what is the pdf of $Y_1 = \frac{X_1 - X_2}{2}$.

20. (a) State and prove the Central Limit Theorem.

Or

- (b) (i) If Y is $b(72, \frac{1}{3})$, find the approximate value of $P(22 < Y < 28)$.

- (ii) If Y is $b(100, \frac{1}{2})$, find the approximate value of $P(Y = 50)$.
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