

QP CODE: 105018

Reg. No:

**First Year B.Sc (MRT) Degree Supplementary Examinations
September 2023**

Mathematics

Time: 3 Hours

Total Marks: 100

- Answer all questions to the point neatly and legibly • Do not leave any blank pages between answers • Indicate the question number correctly for the answer in the margin space
- Answer all parts of a single question together • Leave sufficient space between answers
- Draw table/diagrams/flow charts wherever necessary

Essay

(2x20=40)

1. (a) Calculate the mode of the following data

Class	0-9	10-19	20-29	30-39	40-49	50-59
f	5	10	17	33	22	13

(b) Using Simpson's rule, evaluate $\int_0^1 \frac{1}{1+x^2} dx$

2. (a) Integrate the following

(i) $\int \frac{x dx}{(x^2+3)^2}$ (ii) $\int_0^2 \frac{x+2}{x+1} dx$

(b) Find the divergence and curl of $\vec{v} = xyz\hat{i} + (xz^2 - y^2z)\hat{k}$ at the points (2, -1, 1)

Short notes:

(8x5=40)

- Using crammer's rule, solve $x + y + z = 3, x + 2y + 3z = 4, x + 4y + 9z = 6$
- Find the sum of the series $1 + 4 + 7 + 10 + \dots \dots 40 \text{ terms}$
- Find the area of the triangle formed by the points (5,2), (4,7), and (7, -4)
- If $\sin(A - B) = \frac{1}{2}, \cos(A + B) = \frac{1}{2}, 0 < A + B \leq 90, A > B$, find A and B
- Differentiate $\cos^{-1}(e^x)$ with respect to x
- Find the values of $(-1)^{1/6}$
- Find the correlation coefficient and the equations of regression lines for the following values of x and y

x	1	2	3	4	5
y	2	5	3	8	7

10. Find the Fourier transform of $f(x) = \begin{cases} 1 & |x| < a \\ 0 & |x| > a \end{cases}$

P.T.O

Answer briefly:

(10x2=20)

11. Find the value of $\begin{vmatrix} 1 & 2 & 0 \\ 0 & 1 & 2 \\ 1 & 0 & 2 \end{vmatrix}$

12. Find the value of 9P_3

13. Express $\cot 85^\circ + \cos 75^\circ$ in terms of trigonometric ratios of angles between 0° and 45°

14. Solve $\tan x + \sec x = 2 \cos x$

15. Find the $\text{div} \vec{r}$ if $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$

16. Find the modulus of the complex $\frac{1+2i}{1-3i}$

17. The mean and variance of a Binomial distribution are 4 and $\frac{4}{3}$ respectively. Find $P(X = 1)$ if $n = 6$

18. Find the Laplace transform of $e^{-4t} \sin 3t$

19. Find the simplest value of $64 \times 8^{-4/3}$

20. Find $\frac{dy}{dx}$ if $x = at^2$, $y = 2at$
