

QP CODE: 105018

Reg. No: .....

**First Year B.Sc (MRT) Degree Supplementary Examinations  
September 2022**

**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. Simplify  $\frac{(\cos 5\theta - i \sin 5\theta)^2 (\cos 7\theta + i \sin 7\theta)^{-3}}{(\cos 4\theta - i \sin 4\theta)^9 (\cos \theta + i \sin \theta)^5}$ .

A random variable X has a probability mass function as given below

X	0	1	2	3
f(x)	$\frac{k}{2}$	$\frac{k}{3}$	$\frac{k+1}{3}$	$\frac{2k-1}{6}$

Find the value of k.

Find the mean and variance of X.

2. Using binomial theorem find the value of  $(1.01)^5$  correct to 4 places of decimal.

Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  using trapezoidal rule with n=10.

Short notes:

(8x5=40)

3. Find  $\lim_{x \rightarrow 0} \frac{\sin 4x}{x}$ .

4. If  $w = x^3y^2 - xy^5$  find  $\frac{\partial^2 w}{\partial x \partial y}$  and  $\frac{d^2 w}{dx^2}$ .

5. Find the Laplace transform of (i)  $\sin t \cos 2t$  (ii)  $\sin^2 2t$ .

6. If the probability of a bad reaction from an injection is 0.001, determine the chance that out of 2000 individuals more than 2 will get a bad reaction.

7. Find the divergence and curl of  $\vec{F} = 3x^2\vec{i} + 5xy^2\vec{j} + 5xyz^3\vec{k}$  at the point (1,2,3).

8. Find the modulus amplitude form of  $z = 3 + \sqrt{3}i$ .

9. Prove that  $\frac{(x^{a+b})^2 (x^{b+c})^2 (x^{c+a})^2}{(x^a x^b x^c)^4} = 1$ .

10. Evaluate  $\int \frac{x dx}{(x^2+3)^2}$ .

P.T.O

**Answer briefly:**

**(10x2=20)**

11. Which term of the arithmetic progression 21, 18, 15, ..... is -81.
12. If in a triangle ABC  $a = 15, b = 36, c = 39$ , find  $\sin \frac{A}{2}$ .
13. Find the correlation coefficient of the following data  
 $n=18 \sum x=12, y=18 \sum x^2=60, \sum y^2=96, \sum xy=48$ .
14. Find the median of 75, 71, 73, 70, 74, 80, 85, 81, 86, 79.
15. Find  $\text{grad} \phi$  if  $\phi = x^2yz + 4xz^2$ .
16. Find  $\int_0^{2\pi} \cos 2\theta d\theta$ .
17. Solve  $(x + 1) \frac{dy}{dx} = 2e^{-y}$ .
18. Find the modulus of  $3 - 4i$ .
19. In how many different ways can the letters of the word SUNDAY be arranged?
20. Find the value of the determinant  $\begin{vmatrix} 3 & 4 & -3 \\ 2 & 1 & 5 \\ 4 & -2 & 6 \end{vmatrix}$ .

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