

QP CODE: 105018

Reg. No: .....

**First Year B.Sc (MRT) Degree Regular/Supplementary Examinations  
March 2021**

**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. Solve the following equations by Crammer's Rule:

$$x + y + z = 3, \quad 2x + 3y + 4z = 9, \quad x + 2y - 4z = -1$$

Prove that  $\frac{1}{1+x^{b-c}+x^{b-a}} + \frac{1}{1+x^{c-a}+x^{c-b}} + \frac{1}{1+x^{a-b}+x^{a-c}} = 1$

2. Evaluate the following integrals

- $\int (2x + 3)(x^2 + 3x - 1)^{1/2} dx$

- $\int x \log x dx$

Find the divergence and curl of the vector  $\vec{V} = xyz\vec{i} + 3x^2y\vec{j} + (xz^2 - y^2z)\vec{k}$  at the point (2, -1, 1).

**Short notes:**

**(8x5=40)**

3. Find Laplace transform of  $e^{bt} \cos at$  and  $\sin^2 2t$ .
4. Find  $\lim_{x \rightarrow -2} \frac{x^2 - x - 6}{(x+2)^2}$ .
5. If  $z = x \cos y - y \cos x$ , find  $\frac{\partial^2 z}{\partial x^2}$  and  $\frac{\partial^2 z}{\partial y^2}$ .
6. In 256 sets of 12 tosses of a coin, in how many cases one can expect 8 heads and 4 tails.
7. Find the Laplace transform of  $e^{2t} + 4t^3 - 2 \sin 3t + 3 \cos 3t$ .
8. Solve the equation  $z^3 = 1$ .
9. If  $x^a = y^b = z^c$  and  $y^2 = zx$ , Show that  $\frac{1}{a} + \frac{1}{c} = \frac{2}{b}$ .
10. Evaluate  $\int \frac{dx}{(2x-3)^2}$ .

**P.T.O**

**Answer briefly:**

**(10x2=20)**

11. Find the 80th term of 2, 5, 8, 11, .....
12. Write the simplest form of  $8x(4)^{-3/2}$ .
13. The regression equations of two variables x and y are  $x = 0.7y + 5.2$ ,  $y = 0.3x + 2.8$ . Find the mean of the variables.
14. Simplify  $\frac{(\cos \theta + i \sin \theta)^8}{(\cos \theta - i \sin \theta)^3}$ .
15. Find  $\int_0^\pi \sin x \, dx$ .
16. Find the mod of 61, 62, 62, 63, 61, 64, 63, 64, 60, 65, 63, 64, 65, 66, 64.
17. Show that the three vectors  $\bar{i} - 2\bar{j} + 3\bar{k}$ ,  $2\bar{i} + 3\bar{j} - 4\bar{k}$ ,  $-7\bar{j} + 10\bar{k}$  are collinear.
18. Find  $\text{grad} \varphi$  if  $\varphi = xy^2 + yz^3$ .
19. Solve  $\frac{dy}{dx} = e^{3x-2y}$ .
20. Find AB where  $A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$ ,  $B = \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix}$ .

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