

**First Year B.Sc (MRT) Degree Supplementary Examinations
March 2018**

Mathematics

Time: 3 Hours

Total Marks: 100

- Answer all Questions.
- Draw Diagrams wherever necessary.

Essay**(2x20=40)**

- Find the sum of the series $1+4+7+10+\dots$ 40 terms.
Find the coefficient of x^{10} in the binomial expansion of $(2x^2 - \frac{3}{x})^{11}$ when $x \neq 0$.
Using Cramm's rule solve $x + y + z = 6, x + 2y + 3z = 14, -x + y - z = -2$.
- Prove that $\sec A(1 - \sin A)(\sec A + \tan A) = 1$.
Find the value of $\cos 15^\circ$
Solve $7\sin^2 x + 3\cos^2 x = 4$.

Short notes:**(8x5=40)**

- Obtain the inverse of $\begin{bmatrix} 1 & 3 \\ 2 & -2 \end{bmatrix}$
- How many different permutations are there of all the letters of the word *ALABAMA*
- Find the derivative of $\sin \sqrt{x}$
- Find $\int \frac{2x}{1+x^2} dx$
- Find the divergence and curl of $\vec{V}$ where $\vec{V} = (x^2 + yz)\mathbf{i} + (y^2 + zx)\mathbf{j} + (z^2 + xy)\mathbf{k}$
- Find $\vec{a} \times \vec{b}$ if $\vec{a} = \mathbf{i} - 7\mathbf{j} + 7\mathbf{k}$ and $\vec{b} = 3\mathbf{i} - 2\mathbf{j} + 2\mathbf{k}$
- Find the mean of the following data

X	4	6	9	10	15
Y	5	10	10	7	8

- Find the Laplace transform of $e^{-3t} (2 \cos 5t - 3 \sin 5t)$.

Answer briefly:**(10x2=20)**

- Define an orthogonal matrix.
- Given $\log 2 = 0.3010$ and $\log 3 = 0.4771$ find the value of $\log 0.0075$
- Write the formulae for $\sin(A - B)$, $\tan(A + B)$
- Evaluate $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$
- Find the first order partial derivative $\frac{\partial w}{\partial x}$ of $w = x \cos y - y \cos x$.
- Find $\text{grad } \Phi$ where $\Phi = 3x^2y - y^3z^2$
- State DeMoivre's theorem
- Find the median of 20, 25, 17, 18, 8, 15, 22, 11, 9, 14.
- Write the probability density function of binomial distribution
- Given $y' = -y$ and $y(0) = 1$, determine the value of y at $x = 0.01, 0.02$ by Euler method.
