

QP CODE: 105018

Reg. No:

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

- (a) In 800 families with 5 children each, how many would you expect to have
(i) 3 boys (ii) 4 girls (iii) atmost 2 girls
(Assume equal probabilities for boys and girls)
(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's rule
- (a) Evaluate the following
(i) $\int \frac{dx}{(2x-3)^2}$ (ii) $\int \log x \, dx$ (iii) $\int_2^5 (2x+5)dx$
(b) Find $\text{div} \bar{F}$ and $\text{curl} \bar{F}$ where $\bar{F} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$

Short notes:

(8x5=40)

- Find the term independent of x in the expansion of $\left(x - \frac{2}{x^2}\right)^{15}$
- Find the sum of n terms
 $4 + 44 + 444 + \dots \dots n \text{ terms}$
- Prove that $\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\text{cosec } A - 1}{\text{cosec } A + 1}$
- Prove that for any real numbers x and y , $\cos x = \cos y$ implies $x = 2n\pi \pm y$, where $n \in \mathbb{Z}$.
- If $v = (x^2 + y^2 + z^2)^{-1/2}$, prove that $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} = 0$
- Find the modules and amplitude of $z = \frac{1}{1+i}$
- The two regression equations of the variables x and y are $x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$. Find
(i) The mean of x (ii) mean of y and (iii) the correlation coefficient between x and y
- Find the Laplace transform of $t^3 e^{-3t}$

P.T.O

Answer briefly:

(10x2=20)

11. Find the determinant of $\begin{vmatrix} 2 & 5 \\ 1 & 3 \end{vmatrix}$
12. Find the number of ways of choosing 4 cards of same suit from a pack of 52 playing cards
13. If $\cos x = \frac{-3}{5}$ and x lies in the third quadrant, find the values of $\sin x$ and $\tan x$.
14. Find the principal value of $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$
15. If $\vec{a} = 4\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - \hat{j} + 2\hat{k}$, find $\vec{a} \cdot \vec{b}$ and $\vec{a} \times \vec{b}$
16. Five men in a company of 20 are graduates. If 3 men are picked out of 20 at random, what is the probability that they are all graduates
17. If a random variable has a Poisson distribution such that $P(1) = P(2)$, find the mean of the distribution
18. Find the simplest value of $32 \times (8)^{\frac{-1}{3}}$
19. Find the derivative of $2x^2 + 4x + 3$
20. Find the 8th term of the sequence $2, 1, \frac{1}{2}, \frac{1}{4}, \dots$
