

First Year B.Sc (MRT) Degree Examinations August 2018

Mathematics

Time: 3 Hours

Total Marks: 100

- Answer all Questions.
- Draw Diagrams wherever necessary.

Essay

(2x20=40)

1. • If X is a Poisson variate such that $P(X = 2) = 9P(X = 4) + 90P(X = 6)$.
- Find the coefficient of correlation from the following data

| | | | | | | |
|---|----|----|----|----|----|----|
| x | 10 | 14 | 18 | 22 | 26 | 30 |
| y | 18 | 12 | 24 | 6 | 30 | 36 |

2. • Using Simpson's 1/3rd rule, evaluate $\int_0^6 \frac{dx}{1+x^2}$.

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

- Using mathematical induction, prove that for all $n \geq 1$,

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

Short notes:

(8x5=40)

3. The sum of 3 consecutive numbers in geometric progression is -6 and their product is 64. Find the numbers.

4. Find the value of $\begin{vmatrix} 2 & 3 & 1 \\ 3 & 2 & -2 \\ 4 & -4 & 3 \end{vmatrix}$.

5. If $\sin x = \frac{3}{5}$, $\cos y = \frac{-12}{13}$ where x and y both lie in the second quadrant, find the value of $\sin(x + y)$.

6. Prove that $\sin 2x + 2 \sin 4x + \sin 6x = 4 \cos^2 x \sin 4x$.

7. Find $\lim_{x \rightarrow 1} \frac{x^{15} - 1}{x^{10} - 1}$.

8. Find the derivative of $(ax+b)^n$.

9. Find $[\vec{a} \ \vec{b} \ \vec{c}]$ if $\vec{a} = 2\vec{i} - 3\vec{j}$, $\vec{b} = \vec{i} + \vec{j} - \vec{k}$, $\vec{c} = 3\vec{i} - \vec{k}$.

10. Ten eggs are drawn successively with replacement from a lot containing 10% defective eggs. Find the probability that there is at least one defective egg

P.T.O

Answer briefly:

(10x2=20)

11. Solve $\frac{dy}{dx} = \frac{x}{y}$.
12. The arithmetic mean of 50 items of a series, calculated by a student is 20. However it was later discovered that an item of value 25 was misread as 35. Find the correct value of mean.
13. Calculate the median of the following observations: 60,62,70,69,63,65,60,68,63,64.
14. State the exponential rule of indices.
15. Express $(1 - i)$ in the form $r(\cos \theta + i \sin \theta)$.
16. Find a vector perpendicular to both the vectors $\vec{a} = 2\vec{i} + 2\vec{j} - \vec{k}$ and $\vec{b} = 6\vec{i} - 3\vec{j} + 2\vec{k}$.
17. Evaluate $\int_2^3 x^2 dx$.
18. What is meant by an identity matrix
19. Find adj A for $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$.
20. Find the derivative of $\tan(2x + 3)$.
