First Year B.Sc (MRT) Degree Supplementary Examinations
September 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. If the probability that an individual suffers a bad reaction from an injection is 0.001, find the probability that out of 2000 individuals: exactly 3; more than 2 individuals, suffer a bad reaction

    Calculate the mode of the following data:

Class:	0-9	10-19	20-29	30-39	40-49	50-59
f :	5	10	17	33	22	13

2. Use trapezoidal rule to estimate $\int_0^2 e^{x^2}\, dx$ taking the number of intervals as 10.

    Simplify $\dfrac{(cos3\theta + isin3\theta)^5(cos\theta - isin\theta)^3}{(cos5\theta + isin5\theta)^7(cos2\theta - isin2\theta)^5}$

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

3. Find the sum of the series 1+4+7+10+………

4. Find the value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+a & 1 \\ 1 & 1 & 1+b \end{vmatrix}$

5. Prove that $\dfrac{sinA+sin3A}{cosA+cos3A} = tan2A$.

6. If $sin\alpha = \frac{4}{5}$ and $cos\beta = \frac{5}{13}$ $where\alpha$ and β lie in the first quadrant, then find the value of $sin(\alpha + \beta)$.

7. Find $\lim\limits_{x \to -2} \dfrac{x^2-4}{x+2}$.

8. Find the derivative of $(2x + 3)^3$.

9. Find $grad\varphi$ where φ is given by $\varphi = 3x^2y - y^3z^2$ at the point (1,-2,-1).

10. A committee is to be constituted by selecting two people at random from a group consisting of 3 Economists and 4 Statisticians. Find the probability that the committee will consists of 2 Economists, 1 Economist and 1 Statistician.

P.T.O

Answer briefly: (10x2=20)

11. Solve $\frac{dy}{dx} = e^{2x+3y}$.

12. Find 3 numbers in Geometric progression whose sum is 19 and their product is 216.

13. Find the median of the following: 75, 71, 73, 70, 74, 80, 85, 81, 86, 79.

14. Find the simplest form of $243 \times (27)^{-4/3}$.

15. Express $3 + i$ in the form $r\ (cos\theta + i\ sin\theta)$.

16. Find the curl of $\vec{F} = (x^2 + yz)i + (y^2 + zx)j + (x^2 + xy)k$.

17. Find $\int_0^{\pi/2} \sin x\, dx$.

18. Define a square matrix.

19. In how many ways can 8 persons be arranged on a line so that a particular two persons are always together.

20. Find Laplace transform of $t^3 e^{-3t}$.

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