First Year B.Sc (MRT) Degree Regular/Supplementary Examinations August 2019

Mathematics

Time: 3 Hours   **Total Marks: 100**

- Answer all Questions.
- Draw Diagrams wherever necessary.

Essay   **(2x20=40)**

1. If X follows Poisson distribution and if 3P(X=2) = 2P(X=1) find P(X=0) and P(X=3).

   Calculate the correlation coefficient for the following data

X :	2	4	5	6	8	11
Y :	18	12	10	8	7	5

2. Find the Fourier transform of f(x)=$\begin{cases} e^{-ax} & x > 0 \\ 0 & x < 0 \end{cases}$ where a>0.

   Prove that $\dfrac{(cos3\theta+isin3\theta)^5(cos2\theta-isin2\theta)^3}{(cos4\theta+isin4\theta)^{-9}(cos5\theta+isin5\theta)^9}$ =1.

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

3. Find the coefficient of of x^4 in the expansion of $\dfrac{1-3x+x^2}{e^x}$.

4. Find the value of the determinant $\begin{vmatrix} 2 & 5 & 7 \\ 3 & 6 & 10 \\ 8 & 4 & 15 \end{vmatrix}$

5. Solve the equation $\sqrt{3}sin\theta - cos\theta = \sqrt{2}$.

6. If $cos\,\theta = \dfrac{5}{13}$ where $\dfrac{3\pi}{2} < \theta < 2\pi, find\,the\,value\,of$ $\dfrac{13sin\theta+5sec\theta}{5tan\theta+6cosec\theta}$.

7. Find $\lim\limits_{x\to3}\dfrac{x^3-27}{x-3}$.

8. Find the derivative of $(2x+1)(x+2)$

9. Find the values of ' a' for which the vectors 3i + 2j + 9k and i+aj+3k are
   - perpendicular
   - parallel.

10. A bag contains 7 white and 9 black balls. Three balls are drawn together, what is the probability that: all are black and 1 white and 2 black balls.

Answer briefly: (10x2=20)

11. Solve $\frac{dy}{dx} = \frac{y}{x}$

12. The third and sixth term of an arithmetic progression are 7 and 13 respectively, find the first term and the common difference.

13. Determine the mode of 420, 395, 342, 444, 551, 395, 425, 417, 395, 401, 390.

14. Find the simplest value of $64 \times (8)^{-4/3}$

15. Find the modulus of $3 - 4i$

16. Find the divergence of $\bar{r} = xi + yj + zk$

17. Find $\int_1^3 x^4 \, dx$

18. Find AB where A=$\begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$ and B= $\begin{pmatrix} 1 & -1 \\ -3 & 2 \end{pmatrix}$

19. Simplify $\frac{(cos\theta + isin\theta)^4}{(cos\theta - isin\theta)^5}$

20. In a triangle ABC, if $a = 15, b = 36, c = 39$ find $\sin\frac{A}{2}$.

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