A

(20623)

BCA – IV Sem.

Printed Pages : 3

Roll No. ....

18020

B.C.A. Examination, June–2023

MATHEMATICS-III

(BCA-406)

Time : 3 Hours] *[Maximum Marks : 75*

Note: Attempt all the Sections as per instructions.

Section–A

(Very Short Answer Type Questions)

Note : Attempt all the *five* questions. Each question carries 3 marks. 5 ×3=15

1. Define Fourier Series.

2. Solve : $(x+y)dx - (x-y)\,dy = 0$

3. Solve $y'' - 9y' + 20y = 0$

4. Find the argument of the following Complex number:

   $-1 - i\sqrt{3}$

5. If $f = x^2 z\,\hat{i} - 2y^3 z^2\,\hat{j} + xy^2 z\,\hat{k}$ find div f at $(1, -1, 1)$.

Section–B

(Short Answer Type Questions)

Note: Attempt any *two* questions out of the following three questions. Each question carries 7.5 marks. 2 × 7.5=15

6. Define Convergent sequence. Show that the sequence $<\frac{1}{n}>$ has the limit 0.

7. Explain Cauchy's root test. Test for Convergence

   $$\sum\left(\frac{n+1}{n+2}\right)^n . x^n, \ (x > 0)$$

8. If Z_1 and Z_2 are complex numbers then prove that:

   $$|Z_1 + Z_2|^2 + |Z_1 - Z_2|^2 = \{|Z_1|^2 + |Z_2|^2\}$$

Section–C

(Descriptive Answer Questions)

Note: Attempt any *three* questions out of the following five questions. Each question carries 15 marks. 3 ×15=45

9. Find the Fourier series to represent $f(x) = \pi - x$, for $0 < x < 2\pi$.

10. (a) Solve the following equations by finding an integrating factor :

$$xdy + ydx + 3x^3 y^4 dy = 0$$

(b) Solve :

$$xy^2 y' + y^3 = x \cos x;$$

11. Find the general solutions of the following equation:

$$y'' + 4y = 3 \sin x$$

12. Define curl and divergence of a vector. Prove the following vector identity:

$$\text{div}\left(\vec{u} \times \vec{v}\right) = \vec{v} \cdot \text{curl } \vec{u} - \vec{u} \cdot \text{curl } \vec{v}.$$

13. (a) Test the Convergence the series

$$x^2 + \frac{2^2}{3.4}x^4 + \frac{2^2.4^2}{3.4.5.6}x^6 + \frac{2^2.4^2.6^2}{3.4.5.6.7.8}x^8 + \text{——}$$

(v) Show that the series $\frac{2}{12} - \frac{3}{2^2} + \frac{4}{3^2} - \frac{5}{4^2} + ...$ Converges conditionally.