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(20623)

BCA – IV Sem.

Printed Pages : 3

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# 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 $f = x^2z\,\hat{i} - 2y^3z^2\,\hat{j} + xy^2z\,\hat{k}$ 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. $2 \times 7.5 = 15$

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 $\frac{2}{12} - \frac{3}{2^2} + \frac{4}{3^2} - \frac{5}{4^2} + \ldots$ Converges conditionally.