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(20525) Roll No. .....

B.C.A. - IV Sem.

18020

B.C.A. Examination, May-2025

MATHEMATICS-III

(BCA-406)

Time : Three 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 **three** marks. $3\times5=15$

1. Define argument of a complex number and find the argument of $\frac{2+i}{4i+(1+i)^2}$.

2. Test the convergence of the series

$$\frac{1}{1+x}+\frac{1}{2+x}+\frac{1}{3+x}+\ldots.$$

3. If, $\vec{r}=(\cos nt)\hat{i}+(\sin nt)\hat{j}$ where n is a constant and t varies, find $\vec{r}\times\frac{d\vec{r}}{dt}$.

4. Solve $3e^x \tan y\, dx+(1-e^x)\sec^2 y\, dy=0$

5. Solve $(D^2+D+1)^2y=0$

Section-B

(Short Answer Type Questions)

Note : Attempt any **two** questions out of the three questions. Each question carries **7.5** marks. $2\times7.5=15$

6. Solve the equation

$$\frac{(1+i)x-2i}{3+i}+\frac{(2-3i)y+i}{3-i}=i,\ x,y\in R$$

7. Define Directional Derivative of a point. Find the directional derivative of the function $f(x,y,z)=xy+yz+zx$ in the direction of the vector $2\hat{i}+3\hat{j}+6\hat{k}$ at the point (3, 1, 2).

8. Solve $\frac{dy}{dx}-x^3y^3+xy=0$

Section-C

(Descriptive Answer Type Questions)

Note : Attempt any **three** questions out of the following **five** questions. Each question carries **equal** marks.

$3\times15=45$

9. Test the convergence of the series

$$1+\frac{2x}{2!}+\frac{3^2x^2}{3!}+\frac{4^3x^3}{4!}+\ldots.$$

10. If $\nabla^2 f(r)=0$, show that $f(r)=c_1\log r+c_2$ where $r^2=x^2+y^2$ and c_1 and c_2 are arbitrary constants.

11. Find the Fourier series for the function

$$f(x)=\begin{cases}k(x-c) & ,-c<x<0\\ k(c+x) & ,0<x<c\end{cases}$$

12. Solve $\frac{xdx+ydy}{xdy-ydx}=\sqrt{\frac{a^2-x^2-y^2}{x^2+y^2}}$

13. (a) Find the particular integral of the following differential equation by the method of undetermined coefficients-

$(D^2+1)y=\cos x$

(b) Solve $(D^2-2D+1)y=x\,e^x\cos x$