

Roll No.....

2

Section-B

(4x10=40)

BCA-405(N)
B. C. A. (Semester-IV) Exam. -2014
(New Course)
Paper: Fifth
Mathematics-III

Time: Three Hours] [Maximum Marks: 75

Note: Section A compulsory. Attempt any ten questions out of thirteen questions from Section B and one question from Section C.

Section-A (10x2=20)

1. (i) Find the complete solution of
$$\frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$$
- (ii) Solve the differential equation by using method of undetermined coefficient
$$(D^3 - 2D^2 + D - 2)y = 5\cos 2x - 6x^2$$
2. (i) Test for convergence the series
$$\frac{1}{2\sqrt{1}} + \frac{x^2}{3\sqrt{2}} + \frac{x^4}{4\sqrt{3}} + \frac{x^6}{5\sqrt{4}} + \dots \dots \infty$$
- (ii)
$$1 + \frac{2!}{2^2} + \frac{3!}{3^3} + \frac{4!}{4^4} + \dots \infty$$

3. Find all the values of $\left(\frac{1}{2} + \frac{\sqrt{3}i}{2}\right)^{3/4}$
4. Discuss the nature of the following series:
$$\sum \frac{(n+1)^n x^n}{x^{n+1}}$$
5. What is the directional derivative of $\phi = xy^2 + yz^3$ at the point (2,-1,1) in the direction of the normal to the surface $x \log z - y^2 = -4$ at (-1,2,1)?
6. Expand $\pi x - x^2$ in a half-range sine series in the interval $(0, \pi)$ up to the first three terms.
7. Solve $(y^2 e^{xy^2} + yx^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$
8. Solve $xy(1 + xy^2) \frac{dy}{dx} = 1$
9. Solve $x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = x + \log x$
10. Find the complete solution of $(D^2 + a^2)y = \sec ax$

11. Examine for convergence of the series

(i) $1 + 2 + 3 + \dots + n + \dots + \infty$

(ii) $5 - 4 - 1 + 5 - 4 - 1 + 5 - 4 - 1 + \dots \infty$

12. Obtain Fourier series for the function $f(x)$ given by

$$f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi}, & 0 \leq x \leq \pi \end{cases}$$

Hence deduce that

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$$

13. Separate $\tan^{-1}(x + iy)$ into real and imaginary parts.

<http://csjmuonline.com>

14. A particle moves along the curve $R = (t^3 - 4t)I + (t^2 + 4t)J + (8t^2 - 3t^3)K$ <http://csjmuonline.com>

Where t denotes time. Find the magnitudes of acceleration along the tangent and normal at time t=2.

15. Evaluate:

(i) $\operatorname{div}[3x^2I + 5xy^2J + xyz^3k]$ at the point (1, 2, 3)

(ii) $\operatorname{Curl}[e^{xyz}(I + J + K)]$

Section-C

(15x1=15)

16. Expand $f(x) = x$ as half range

(i) Sine series in $0 < x < 2$

(ii) Cosine series in $0 < x < 2$

17. Solve the following differential equation:

$$(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$$

18. Discuss the convergence of the series

$$x + \frac{2^2 x^2}{2!} + \frac{3^3 x^3}{3!} + \frac{4^4 x^4}{4!} + \frac{5^5 x^5}{5!} + \dots \infty$$