G

(21218)

BCA-I Sem.

Roll No. ....

18005

B. C. A. Examination, Dec. 2018

MATHEMATICS-I

(BCA-101)

(New Course)

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

Note : Attempt questions from all Sections as per instructions.

Section-A

(Very Short Answer Questions)

Attempt all the *five* questions. Each question carries 3 marks. Very short answer is required.

$3 \times 5 = 15$

1. Show that $A = \begin{bmatrix} 3 & 1+2i \\ 1-2i & 2 \end{bmatrix}$ is Hermitian.

2. Define limit of a function at a point.

3. Find the asymptotes of the curve $\dfrac{a^2}{x^2} - \dfrac{b^2}{y^2} = 1$.

4. State fundamental theorem of calculus.

5. Define vector in 2-dimension with example.

Section-B

(Short Answer Questions)

Attempt any *two* questions out of the following three questions. Each question carries 7½ marks. Short answer is required. $7\frac{1}{2} \times 2 = 15$

6. Determine the values of a, b, c for which the function :

$$f(x) = \begin{cases} \dfrac{\sin(a+1)x + \sin x}{x} & \text{for } x < 0 \\ c & \text{for } x = 0 \\ \dfrac{(x+bx^2)^{1/2} - x^{1/2}}{bx^{3/2}} & \text{for } x > 0 \end{cases}$$

is continuous at $x = 0$.

18005

7. If $y = a \cos (\log x) + b \sin (\log x)$, show that :

$$x^2 y_2 + xy_1 + y = 0 \text{ and } x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0.$$

8. Calculate the area of parallelogram spanned by the vectors $a = (1, -1, 3)$ and $b = (2, -7, 1)$.

Section-C

(Detailed Answer Questions)

Attempt any *three* questions out of the following five questions. Each question carries 15 marks. Answer is required in detail. $15 \times 3 = 45$

9. Verify Cayley -Hamilton theorem for the matrix :

$$A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}.$$

Also determine the characteristic roots and corresponding characteristic vector of the matrix A.

10. Check the continuity of the following functions at $x = 0$:

   (i) $f(x) = \dfrac{|x|}{x}$ for $x \neq 0$ and $f(0) = 0$

   (ii) $f(x) = \dfrac{e^{1/x} \sin(1/x)}{1 + e^{1/x}}$ for $x \neq 0$ and $f(0) = 0$.

11. Trace the curve $9ay^2 = (x - 2a)(x - 5a)^2$.

12. (i) Expand $\dfrac{e^x}{e^x + 1}$ by Maclaurin's theorem.

   (ii) Expand $\log x$ in power of $(x - 1)$ by Taylor's theorem.

13. Evaluate :

   (i) $\int \tan^4 x \, dx$

   (ii) $\int \dfrac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} dx.$