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(201217) Roll No.....

BCA-I Sem.

18005

B.C.A. Examination, Dec. 2017

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)

Note : Attempt all the **five** questions of this section. Each question carries **3** marks. Very short answer is required. 3×5=15

1. Show that $A = \begin{bmatrix} 1 & 1-i & 2 \\ 1+i & 3 & i \\ 2 & -i & 0 \end{bmatrix}$ is Hermitian.

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- 2. Define continuity of a function at a point. 3
- 3. Show that the parabola $y^2-4ax=0$ has no asymptote. 3
- 4. Define Gamma and Beta function. 3
- 5. Define vector in 3-dimensions with example. 3

Section-B

(Short Answer Questions)

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

6. A function $f(x)$ is defined as follows:

$$f(x) = \begin{cases} (x^2/a) - a, & \text{when } x < a \\ 0 & , \text{ when } x = a \\ a - (a^2/x), & \text{when } x > a \end{cases}$$

Prove that the function $f(x)$ is continuous at $x=a$.

7. Find n^{th} differential coefficient of $x^3 \cos x$.

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8. Find the area of a rectangle having vertices A,B,C & D with position vectors.

$$a = \left(-1, \frac{1}{2}, 4\right), b = \left(1, \frac{1}{2}, 4\right)$$

$$c = \left(1, \frac{-1}{2}, 4\right), d = \left(-1, \frac{-1}{2}, 4\right)$$

respectively.

Section-C

(Detailed Answer Questions)

Note : Answer any **three** questions out of the following **five** questions. Each question carries **15** marks. Answer is required in detail. 15×3=45

9. Verify Cayley-Hamilton theorem 15

$$A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$$

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

10. Examine the continuity of the function:

$$f(x) = \begin{cases} -x^2 & \text{if } x \leq 0 \\ 5x - 4 & \text{if } 0 < x \leq 1 \\ 4x^2 - 3x & \text{if } 1 < x < 2 \\ 3x + 4 & \text{if } x \geq 2 \end{cases}$$

at $x=0, 1$ & 2 . 15

11. Trace the curve $x^3+y^3=3axy$. 15

12. (i) Expand $\log(1+x)$ by Maclaurin's Theorem. 15

- (ii) Expand $\sin x$ in powers of $(x-\pi/2)$ by using Taylor's Theorem. 15

13. Evaluate :

(i) $\int \frac{e^x(1+x)}{\cos^2(e^x x)} dx$

(ii) $\int \sin x \sin 2x \sin 3x dx$