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BCS-012

BACHELOR OF COMPUTER APPLICATION (BCA) (Revised)

Term-End Examination

BCS-012 : BASIC MATHEMATICS

Time : 3 Hours] *[Maximum Marks : 100*

Note: Question number 1 is compulsory. Answer any three questions from remaining four questions.

1. (a) Show that: 5

$$\begin{vmatrix} b-c & c-a & a-b \\ c-a & a-b & b-c \\ a-b & b-c & c-a \end{vmatrix} = 0$$

(b) If $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$, show that:

$A^2 - 5A + I = O$, where I and O are identity and null matrices respectively of order 2. 5

(c) Show that $3^{2n} - 1$ is divisible by 8 for each $n \in \mathbb{N}$. 5

(d) If α, β are roots of $x^2 + ax + b = 0$, find value of $\alpha^4 + \beta^4$ in terms of a, b. 5

(e) If $x = a + b$, $y = aw + bw^2$ and $z = aw^2 + bw$, show that $xyz = a^3 + b^3$ 5

(f) Show that:

$$\underbrace{11\ldots1}_{91}$$

is not a prime. 5

(g) If $y = 3\sin x + 4\cos x$, find $\frac{d^2y}{dx^2}$. 5

(h) Evaluate $\int xe^x dx$. 5

2. (a) If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$, where $i^2 = -1$, show that $(A+B)^2 = A^2 + B^2$. 5

(b) If $A = \begin{bmatrix} -1 & 2 & 0 \\ -1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$, show that $A^2 = A^{-1}$. 5

(c) If $A = \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix}$ and $B = [1 \quad -1 \quad 0]$ find AB and BA. 5

(d) Use principle of Mathematical induction to show that:

$$\frac{1}{2}+\frac{1}{2^2}+.....+\frac{1}{2^n}<1 \qquad \forall n \in \mathbb{N}$$ 5

3. (a) Find sum of all three digit numbers which are divisible by 7. 5

(b) Use De Moivre's theorem to find $\left(1+\sqrt{3}\,i\right)^3$. 5

(c) Solve the inequality: 5

$$\frac{4}{|x-2|}>5$$

(d) Solve the equation:

$$8x^3-14x^2+7x-1=0$$

if the roots are in G.P. 5

4. (a) If $y=\dfrac{\sqrt{x^2+1}+\sqrt{x^2-1}}{\sqrt{x^2+1}-\sqrt{x^2-1}}$, find $\dfrac{dy}{dx}$. 5

(b) Show that: 5

$$f(x)=\frac{1+x+x^2}{1-x+x^2}$$

is a decreasing function on the interval $(1, \infty)$.

(c) Evaluate: 5

$$\int \frac{\left(a^x + b^x\right)^2}{a^x b^x} dx$$ 5

(d) Find the area bounded by the line $y = 3 + 2x$, x-axis and the ordinates $x = 2$ and $x = 3$. 5

5. (a) Show that:

$$\left[\vec{b} + \vec{c} \quad \vec{c} + \vec{a} \quad \vec{a} + \vec{b}\right] = 2\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$$ 5

(b) Show that the lines:

$$\frac{x-5}{4} = \frac{y-7}{-4} = \frac{z-3}{-5}$$ and

$$\frac{x-8}{4} = \frac{y-4}{-4} = \frac{z-5}{8}$$ intersect. 5

(c) Two tailors, A and B, eam Rs. 700 and Rs. 1000 per day respectively. A can stitch 6 shirts and 4 pants while B can stitch 10 shirts and 4 pants per day. How many days shall each have to work if it is desired to produce at least 60 shirts and 32 pants at a minimum labour cost? Also, calculate the least cost.

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