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B.C.A. (SEMESTER-I) EXAMINATION, OCTOBER 2012

BCA103 - BASIC MATHEMATICS

Duration: 2hrs

Max. Marks: 50

Instructions:

1. All questions are compulsory. However, internal choice is provided for questions 2 - 5.
2. Use of calculators is not permitted.
3. Log books will be provided when asked.

Q.1. Fill in the blanks:

(10 x 1 = 10)

- a) If $\log_y x = 100$ and $\log_x y = 10$, then $y =$ _____.
- b) If $5^a = 3125$, then $5^{a-3} =$ _____.
- c) If $a - b = 3$ and $a^2 + b^2 = 29$, then $ab =$ _____.
- d) $i^{42} - 5i^{18} - 4i^{24} =$ _____.
- e) If $\text{LCM}(275, x) = 7700$ and $\text{HCF}(275, x) = 11$, then $x =$ _____.
- f) If $\log 27 = 1.431$ then $\log 9 =$ _____.
- g) $0.125125125\dots$ expressed as a rational number is _____.
- h) $15:18::x:24$, then $x =$ _____.
- i) $(256)^{0.16} \times (256)^{0.09} =$ _____.
- j) If $z = 2 + 3i$, then $|z| =$ _____.

Q.2.

- A. Find the angle between the vectors $\mathbf{a} = 2\mathbf{i} + 3\mathbf{j} + 6\mathbf{k}$ and $\mathbf{b} = 3\mathbf{i} + 6\mathbf{j} + 2\mathbf{k}$. (2)
- B. Find the area and perimeter of a square whose diagonal is 10cm. (3)
- C. Solve the following system of equations by Cramer's rule:

$$\frac{1}{2}x + y - 3z = -4$$

$$4x + 2y - 6z = -2$$

$$5x + 5y + 4z = 4$$

(5)

OR

Q.II.

- a. Find the area of ΔPQR where $\mathbf{PQ} = \mathbf{i} - 4\mathbf{j} - \mathbf{k}$ and $\mathbf{PR} = -2\mathbf{i} - \mathbf{j} + \mathbf{k}$. (2)
- b. Find the ratio of the diameter to the height of a cylinder whose curved surface area is 264 cm^2 and volume is 924 cm^3 . (3)

c. Solve the following system of equations by using matrix inversion method:

$$x + 2y + 2z = 0$$

$$2x - y - 6z = -5$$

$$2y + 5z = 6$$

(5)

Q.3.

A. If $\mathbf{a} = 3\mathbf{i} + 2\mathbf{j}$ and $\mathbf{b} = 2\mathbf{i} + \mathbf{j} - \mathbf{k}$, find the unit vector perpendicular to both \mathbf{a} and \mathbf{b} . (2)

B. Find the fifth term and the infinite sum of the sequence $-3, 1, -1/3, \dots$ (3)

C. Evaluate: $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 5x + 4} - \sqrt{x^2 - 3x + 4})$ (5)

OR

Q.III.

a. Find the value of the constant 'p' for which the vectors $\mathbf{u} = \mathbf{i} + p\mathbf{j} - 5\mathbf{k}$ and $\mathbf{v} = -4\mathbf{i} + p\mathbf{j} + \mathbf{k}$ are orthogonal. (2)

b. Find four terms in A.P. whose sum 24 is and product is 945. (3)

c. Discuss the continuity of the function $f(x)$ at $x = 2$ and $x = 4$, where

$$f(x) = \begin{cases} x^2 - 4 & 0 \leq x \leq 2 \\ 3x + 2 & 2 < x \leq 4 \\ x^2 - 1 & 4 < x \leq 6 \end{cases}$$

(5)

Q.4.

A. Using Trigonometry, prove the identity $\sin 2\theta + \cos 2\theta = 1$. (3)

B. Find the third roots of $\sqrt{3} + i$. (3)

C. Find the equation of the line through the point of intersection of $x + 2y - 4 = 0$ and $x - 3y + 1 = 0$, and also passes through the midpoint of the segment joining $(2, 5)$ and $(4, 3)$. (4)

OR

Q.IV.

a. A plane, flying at an altitude of 600km above sea level spots two boats in the sea, one behind the other in a straight line. If the angles of depression of the plane to the first and second boat are 45 and 30 degrees respectively, then find the distance between the two boats. ($\sqrt{3} = 1.732$) (3)

b. Use De Moivre's theorem to prove that $\cos 2\theta = 2\cos^2\theta - 1$. (3)

- c. Find the point of intersection of the lines $2x - y = 6$ and $x + 2y = -2$. What is the equation of the circle with this point as the centre and radius 5 units? (4)

Q.5.

- A. If $y = \sin^2 x$, show that $y'' - y' \cot x + 2y = 0$. (5)
B. If $\int_1^2 (3x^2 + 2x + k) dx = 8$, find k . (5)

OR

Q.V.

- a. Differentiate w.r.t. x : $f(x) = 5x^2 + 3x + 8 \log x - e^x + 9^x - 7 \sec x$. (5)
b. Integrate w.r.t. x : $\int (\sin x + xe^x - 12x^3) dx$. (5)

-----ALL THE BEST-----