No. of Printed Pages : 4

BCS-012

08415

BACHELOR OF COMPUTER APPLICATIONS (Revised)

Term-End Examination

December, 2013

BCS-012 : BASIC MATHEMATICS

Time : 3 hours *Maximum Marks : 100*

Note : *Question no. **1** is **compulsory.** Attempt **any three** questions from the remaining questions.*

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1. (a) Show that $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ 5

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

(c) Use the principle of mathematical induction to show that $1+3+5+\text{------}+(2n-1)=n^2$ for each $n \in \mathbf{N}$. 5

(d) If α and β are roots of $x^2-3ax+a^2=0$ and $\alpha^2+\beta^2=\frac{7}{9}$, find the value of a. 5

(e) If $y = ax + \frac{b}{x}$, show that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0$ 5

(f) Evaluate the integral $\int e^x \left(e^x + 7\right)^5 dx$. 5

(g) If $\vec{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} - 5\hat{k}$, show that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular to each other. 5

(h) Find the angle between the lines $\frac{x-5}{2} = \frac{y-5}{1} = \frac{z+1}{-1}$ and $\frac{x}{3} = \frac{y-1}{2} = \frac{z+5}{3}$ 5

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

(b) Show that $A = \begin{bmatrix} 3 & 4 & -5 \\ 1 & 1 & 0 \\ 1 & 1 & 5 \end{bmatrix}$ is row equivalent to I_3, where I_3 is identity matrix of order 3. 5

(c) If $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 4A + 7I_2 = 0_{2x2}$. Use this result to find A^5. Where 0_{2x2} is null matrix of order 2x2. 10

3. (a) Solve the equation $6x^3 - 11x^2 - 3x + 2 = 0$, given that the roots are in H.P. 5

(b) If $x+iy=\sqrt{\frac{a+ib}{c+id}}$, show that $(x^2+y^2)^2=\frac{a^2+b^2}{c^2+d^2}$. 5

(c) Solve the inequality $\left|\frac{3x-1}{2}\right| \leq 5$. 5

(d) If α and β be the roots of the equation $3x^2-4x+1=0$, find the equation whose roots are α^2/β and β^2/α. 5

4. (a) Determine the intervals in which the function $f(x)=\frac{1+x+x^2}{1-x+x^2}$, $x \in \mathbf{R}$ is increasing or decreasing. 5

(b) Show that $f(x)=x^2 ln(\frac{1}{x})$, $x>0$ has a local maximum at $x=\frac{1}{\sqrt{e}}$. 5

(c) Evaluate $\int (x+1)e^x\left(xe^x+5\right)^4 dx$. 5

(d) Find the area bounded by $y=\sqrt{x}$ and $y=x$. 5

5. (a) Find the vector and Cartesian equation of the line through the points (3, 0, -1) and (5, 2, 3). 5

(b) Show that $\left[\vec{a}\times\vec{b} \quad \vec{b}\times\vec{c} \quad \vec{c}\times\vec{a}\right]=\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]^2$ 5

(c) Two tailors A and B, earn ₹ 150 and ₹ 200 per day respectively. A can stich 6 shirts and 4 pants while B can stich 10 shirts and 4 pants per day. How many days should each work to stich (at least) 60 shirts and 32 pants at least labour cost ? Also calculate the least cost. **10**