

**BACHELOR IN COMPUTER
APPLICATIONS****Term-End Examination****June, 2007****CS-60 : FOUNDATION COURSE IN
MATHEMATICS IN COMPUTING***Time : 3 hours**Maximum Marks : 75*

Note : Question No. 1 is **compulsory**. Attempt any **two** questions from Questions No. 2 to 5. Calculators are not allowed.

1. (a) Evaluate the following determinant without expansion as far as possible.

$$4\frac{1}{2} \times 10 = 45$$

$$\begin{vmatrix} 43 & 1 & 6 \\ 35 & 7 & 4 \\ 17 & 3 & 2 \end{vmatrix}$$

- (b) Prove that the derivative of an odd function is an even function. Provide an example to illustrate your proof.
- (c) Prove that $f(x) = |x|$ is continuous at $x = 0$.

- (d) Find $\frac{dy}{dx}$, when $x^3 + y^3 = 3axy$.
- (e) Prove that, $f(x) = x^3 - 3x^2 + 15x + 4$ is a monotonically increasing function of x .
- (f) Find the average value of $\sin^2 x$ in the interval $[0, \pi]$.
- (g) (i) Describe the following set by the property method :
 $\{1, 4, 9, 16, \dots\}$
- (ii) Describe the following set by the listing method :
 $\{x \mid x \text{ is the smallest prime number}\}$
- (iii) State whether the following set is finite or infinite :
 The solution set of $2x + 5 = 7$
- (h) If α, β, γ are the roots of the equation
 $ax^3 + bx^2 + cx + d = 0$,
 then by applying the first principles, find the values of $(\alpha + \beta + \gamma)$, $(\alpha\beta + \beta\gamma + \gamma\alpha)$ and $\alpha\beta\gamma$.
- (i) Prove that
 $(ab + xy)(ax + by) > 4abxy$
- (j) Find the intercept made by the sphere
 $x^2 + y^2 + z^2 = 9$ on the line $x - 3 = y = z$.

2. (a) Prove that the product of the perpendiculars drawn from the point (x_1, y_1) on the lines represented by

$$ax^2 + by^2 + 2hxy = 0 \text{ is } \frac{ax_1^2 + 2hx_1y_1 + by_1^2}{[(a-b)^2 + 4h^2]^{1/2}}. \quad 8$$

- (b) Find $\frac{dy}{dx}$, when

$$y = \tan^{-1} \frac{x}{1 + \sqrt{1-x^2}} + \sin \left\{ 2 \tan^{-1} \sqrt{\frac{1-x}{1+x}} \right\} \quad 7$$

3. (a) Show that in general, three normals can be drawn from a point on a parabola and that the sum of the ordinates of the feet of the normals is zero. 5

- (b) If $y = \{x + \sqrt{1+x^2}\}^m$, prove that 5
- $$(1+x^2)y_2 + xy_1 - m^2y = 0$$

- (c) Solve the equation : 5
- $$x^4 + 2x^3 - 21x^2 - 22x + 40 = 0,$$
- given that the roots are in A.P.

4. (a) Find the equation of the plane passing through the points $(1, 1, 2)$ and $(2, 4, 3)$ and perpendicular to the plane $x - 3y + 7z + 5 = 0$. 7

- (b) Evaluate $\int \frac{dx}{x^4 + 1}$ 8

5. (a) Find the area of an equilateral triangle inscribed in the circle $x^2 + y^2 + 2gx + 2fy + c = 0$. 8

(b) Find the centre and the radius of the circle represented by 7

$$x^2 + y^2 + z^2 = 25, \quad x + 2y + 2z + 9 = 0$$