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CS-60

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Pre-Revised)

Term-End Examination

00140

December, 2017

CS-60 : FOUNDATION COURSE IN MATHEMATICS IN COMPUTING

Time : 3 hours *Maximum Marks : 75*

Note : *Question no. 1 is* ***compulsory****. Answer any* ***three*** *questions from questions no. 2 to 6. Use of calculator is permitted.*

1. (a) Which of the collections mentioned below are sets ?

(i) All good spin bowlers produced by Australia

(ii) All months in a calendar year

(iii) All natural numbers which are perfect cubes

(b) Provide an alternative property based definition of the set defined as

$$\{x \mid 7x + 3 = 17\}.$$

(c) Given 'x' is real, find the minimum value of $\left(x + \frac{1}{x}\right)$.

(d) Solve the following equations graphically :

$$x^2 + y^2 = 1, \quad x + y = 1$$

(e) Show that the points (– 5, 5); (7, 10); (10, 6) and (– 2, 1) are the vertices of a parallelogram.

(f) Find the equation of the straight line having slope equal to '3' and passing through the point (1, 2).

(g) Find the centre and radius of the circle whose equation is $x^2 + y^2 + 2x + 4y + 1 = 0$.

(h) Find the vertex, focus and the directrix of the parabola

$$(y - 2)^2 = 8 (x - 3).$$

(i) Find the direction cosines of the line joining the points (1, 1, 2) and (– 1, 2, 4).

(j) Express 'i' as $r (\cos \theta + i \sin \theta)$.

(k) Find $\frac{dy}{dx}$, when $x = a \cos \theta$, $y = b \sin \theta$.

(l) Evaluate :

$$\int e^x (\cos x + \sin x)\, dx$$

(m) Find $\frac{dy}{dx}$, when $y = \log_e \sec x$.

(n) Evaluate :

$$\int_0^{\pi/2} \cos^2 x\, dx$$

(o) Using the meaning of sign of $\frac{dy}{dx}$, explain that $y = \tan x$ is an increasing function of x. Is there any restriction to the above ? *15×3=45*

2. (a) It is given that the Power Set P(S) of any set S is the set of all subsets of S, including the empty set and the set S itself.

Show that the number of elements of P(S) will be 2^n, if the number of elements of the set S is n.

(b) For any two sets A and B in a universal set U, prove that

$$(A \cup B)^c = A^c \cap B^c.$$

(c) For what values of p and q will the quadratic equation $x^2 + px + q = 0$ have $(2 + \sqrt{3})$ as one of its roots ? *3+3+4*

3. (a) If a, b, c, d are real quantities, and if

$$a + ib = c + id,$$

prove that $a = c$, $b = d$.

(b) If 1, ω, ω^2 are the cube roots of unity, find the value of $(1 - \omega)(1 - \omega^2)(1 - \omega^4)(1 - \omega^8)$.

(c) If one root of the equation $ax^2 + bx + c = 0$ be four times the other, then show that $4b^2 = 25ac$. *3+4+3*

4. (a) Find $\frac{dy}{dx}$, when

(i) $y = \tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$

(ii) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

(b) Evaluate :

$$\int \frac{x^2 - 1}{x^4 + 1}\, dx$$ *3+3+4*

5. (a) Find the condition under which the straight line $y = mx + c$ is a tangent to the parabola $y^2 = 4ax$. Hence show that two mutually perpendicular tangents to the parabola would always meet on the directrix.

(b) Show that the normal at the point $(a \sec \theta, b \tan \theta)$ of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

$ax \cos \theta + by \cot \theta = a^2 + b^2$. *5+5*

6. (a) Find the ratio in which the line joining the points (2, –3, 5) and (7, 1, 3) is divided by the xy-plane.

(b) Find the equation of the plane passing through the intersection of the planes $2x + y + 2z = 9$ and $4x - 5y - 4z = 1$ and the point (3, 2, –1).

(c) Find the equation of the sphere through the points (0, 0, 0); (0, 1, –1); (–1, 2, 0) and (1, 2, 3). *3+3+4*
