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CS-60

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

Term-End Examination

01405

June, 2018

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) For $z = \dfrac{24 + 7i}{5 + 12i}$, find $|z|$ and $\arg(z)$.

(b) Evaluate :

$$\int \tan x \, dx$$

(c) For real x, prove that $x + \dfrac{1}{x} \geq 2$. When does the equality sign hold ?

(d) Solve graphically :

$$3x + 2y = 7$$

$$x + y = 3$$

(e) Find $\frac{dy}{dx}$, when $y = \frac{1}{\sqrt{x}}$.

(f) Find the equation of the straight line passing through the origin and perpendicular to $3x + 2y + 4 = 0$.

(g) Find the equation of the circle with centre at (1, 2) and which passes through the origin.

(h) Convert the equation $r = 4 \sin \theta$ to the two-dimensional Cartesian form.

(i) Determine the eccentricity of the hyperbola $4x^2 - 3y^2 = 12$.

(j) Find the angle between the pair of straight lines given by $x^2 - y^2 = 0$.

(k) Evaluate :

$$\int_0^{\pi} \cos 3x \, dx$$

(l) Evaluate :

$$\lim_{x \to \pi} \frac{\sin x}{\pi - x}$$

(m) Prove that $f(x) = \tan 2x$ is a periodic function.

(n) Prove with symbols having usual meaning that, $A \cup \phi = A$, where A is a non-empty set.

(o) Write down the equation of the plane which is parallel to the xy-plane and 3 units above it. *15×3=45*

2\. (a) Solve using Cramer's rule 4

$$x + y = 5, \quad 3x - 4y = 1$$

(b) Solve the quadratic equation

$$x^2 + 5x + 6 = 0.$$ 3

(c) Prove that

$$(1 + i)^2 = 2i.$$ 3

3\. (a) Given that $x + y = 5$, find the maximum value of xy. 3

(b) Find the equation of the straight line passing through the origin and the mid-point of the line joining (1, 2) and (3, 4). 3

(c) Show that the straight line $x + y = 2\sqrt{2}$ is a tangent to the circle $x^2 + y^2 = 4$. 4

4\. (a) Find the condition for which $y = mx + c$ is a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. 4

(b) Find the equation of the normal to the parabola

$$y^2 = 4ax \text{ at } (at^2, 2at).$$

Hence prove that, in general, three normals can be drawn to a parabola from an external point. 4+2

5. (a) Prove that tan x is a continuous function except for x being odd multiples of $\frac{\pi}{2}$. 4

(b) Find $\frac{dy}{dx}$, if $y = \tan^{-1}\left(\frac{a + bx}{b - ax}\right)$. 3

(c) Evaluate : 3

$$\int_0^{\sqrt{3}} x^3 \, dx$$

6. (a) Show that the triangle formed by the points (a, b, c); (b, c, a); (c, a, b) is equilateral. 4

(b) If α, β and γ be the direction angles of a line, show that

$$\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 2.$$ 3

(c) Find the equation of the sphere having its centre at (2, – 3, 4) and radius equal to 5. 3
