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**C14–C–102/C14–CM–102**

# 4015

## BOARD DIPLOMA EXAMINATION, (C–14)

## MARCH/APRIL—2016

## DCE—FIRST YEAR EXAMINATION

ENGINEERING MATHEMATICS—I

*Time* : 3 hours ] [ *Total Marks* : 80

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**PART—A** 3×10=30

***Instructions*** : (1) Answer **all** questions.

(2) Each question carries **three** marks.

**1.** Resolve $\frac{7x \quad 6}{(x \quad 1)(x \quad 2)}$ into partial fractions.

**2.** Solve for $x$, if $\begin{vmatrix} 1 & 0 & 1 \\ 2 & x & 3 \\ 1 & 3 & 2 \end{vmatrix} \quad 3.$

**3.** If $A \quad \begin{matrix} 1 & 2 \\ 3 & 4 \end{matrix}$ and $B \quad \begin{matrix} 3 & 8 \\ 7 & 2 \end{matrix}$, then find the matrix $X$ such that $2X \quad A \quad B$.

**4.** Prove that $\frac{\cos(A \quad B)}{\cos A \sin B} \quad \tan A \quad \cot B$.

**5.** If $\tan \quad 2$, then find $\cos 2$ .

**6.** Express in modulus-amplitude form of the complex number $\sqrt{3} \quad i1$.

**7.** Find the point of intersection of the lines $2x \quad 4y \quad 6$ and $x \quad 4y \quad\quad 3$.

**8.** Find the equation of the circle with (1, 2) and (4, 5) as the end points of a diameter of the circle.

**9.** Evaluate :

$$\underset{x \quad 0}{\text{Lt}} \frac{1 \quad \cos 2x}{\sin 2x}$$

**10.** Find $\frac{dy}{dx}$ if $y \quad ct$ and $x \quad \frac{c}{t}$.



**PART—B**

10×5=50

***Instructions*** : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

**11.** *(a)* Find the inverse of $A \quad \begin{matrix} 2 & 7 & 3 \\ 3 & 9 & 4 \\ 1 & 5 & 3 \end{matrix}$, if exists.

*(b)* Solve the following equations by Cramer's rule :

$$x \quad y \quad z \quad 0,\ 2x \quad y \quad z \quad 1 \text{ and } 3x \quad 2y \quad 2z \quad 5$$

**12.** *(a)* If $\tan^{\ 1} x \quad \tan^{\ 1} y \quad \tan^{\ 1} z \quad \frac{}{2}$, then show that $xy \quad yz \quad zx \quad 1$.

*(b)* Prove that $\cos 10° \cos 50° \cos 70° \quad \frac{\sqrt{3}}{8}$.

**13.** *(a)* If $b\cos^2\frac{C}{2} \quad c\cos^2\frac{B}{2} \quad \frac{3a}{2}$, show that the sides of the triangle are in AP.

*(b)* Solve $\cos \quad \cos 5 \quad \cos 3$ .

**14.** *(a)* Find the equation of the rectangular hyperbola whose focus is ( 1, 3) and the directrix is $x \quad 2y \quad 7 \quad 0$.

*(b)* Find the coordinates of the centre, vertices, eccentricity, foci, length of the latus rectum of the ellipse $25x^2 \quad 16y^2 \quad 1600$.

**15.** *(a)* Find the derivative of $\log[\sin(\cos(e^x))]$ with respect to $x$.

*(b)* Differentiate $\tan^{\ 1}\frac{2x}{1 \quad x^2}$ with respect to $x$.

**16.** *(a)* Find $\frac{dy}{dx}$, if $y \quad \frac{(x \quad 1)^2(2x \quad 3)^2}{(x^2 \quad 2)^2(x^3 \quad 3)^3}$.

*(b)* If $u \quad x^2 \quad y^2 \quad z^2$, then show that $x\frac{u}{x} \quad y\frac{u}{y} \quad z\frac{u}{z} \quad 2u$.

**17.** *(a)* Find the lengths of tangent, normal, sub-tangent and sub-normal to the curve $y \quad x^3 \quad 2x \quad 5$ at the point (1, 4).

*(b)* A ladder is 13 m long leans against a vertical wall. If the lower end is pulled away from the wall at the rate of 1 m/sec along the horizontal floor, how fast is the top descending when the lower end is 12 m away from the wall?

**18.** *(a)* The sum of the lengths of the sides of a rectangle is constant. If the area is to be maximum, then show that the rectangle is a square.

*(b)* The radius of a sphere was determined as 10·01 cm instead of 10 cm. Find approximately the errors in its volume and surface area.

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