



C16-C/CM-102

6017

BOARD DIPLOMA EXAMINATION, (C-16)

MARCH/APRIL—2017

DCE—FIRST YEAR EXAMINATION

ENGINEERING MATHEMATICS—I

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

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

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

1. Resolve

$$\frac{1}{(x-3)(x-1)}$$

into partial fractions.

2. If

$$A = \begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix} \text{ and } B = \begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$$

then find the value of $3A - 5B$.

3. If ω is the cube root of unity, then evaluate

$$\begin{vmatrix} 1 & \omega \\ \omega & 1 \end{vmatrix}$$

4. Show that $\tan 75^\circ - \tan 30^\circ = \tan 75^\circ \tan 30^\circ - 1$.

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5. Show that

$$\frac{\cot A - \tan A}{\cot A + \tan A} = \cos 2A$$

6. Find the conjugate of $(2 - 5i)(4 - 6i)$.

7. Find the point of intersection of the straight lines

$$3x - 4y - 6 = 0 \text{ and } 6x - 5y - 9 = 0$$

8. Find the intercepts made by the straight line $2x - 3y - 6 = 0$ on the coordinate axes.

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{\sin x}$$

10. Find $\frac{dy}{dx}$ if $y = \sqrt{x} \sec x \log x$.

PART—B

10×5=50

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

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

11. (a) If

$$A = \begin{pmatrix} 1 & 1 & 0 \\ 2 & 1 & 3 \\ 4 & 1 & 8 \end{pmatrix} \text{ and } B = \begin{pmatrix} 4 & 1 & 0 \\ 2 & 3 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

then find $(AB)^T$.

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

$$x - 2y + z = 3, 3x - y + z = 4 \text{ and } x + y + 2z = 6$$

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12. (a) Show that $\sin A \sin(120^\circ - A) \sin(120^\circ + A) = 0$.

(b) Show that

$$\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3$$

13. (a) Solve $\sin 7^\circ \sin 4^\circ \sin \theta = 0$.

(b) In a $\triangle ABC$, if $\frac{a}{\cos A} = \frac{b}{\cos B}$, then show that $\triangle ABC$ is an isosceles.

14. (a) Find the equation of the circle with $(-5, 1)$ and $(3, -7)$ as end points of a diameter.

(b) Find the equation of the rectangular hyperbola whose focus is the point $(-1, -3)$ and directrix is the line $2x - y - 1 = 0$.

15. (a) Find the derivative of $\log(1 + \tan^{-1} x)$ w.r.t. x .

(b) If $x = a(\sin \theta)$ and $y = a(1 - \cos \theta)$, then find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

16. (a) If $u = x^3 + y^3 + 3axy$, then show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$.

(b) If $y = x^{x^{x^{\dots}}}$ (times), then find $\frac{dy}{dx}$.

17. (a) Find the equations of tangent and normal to the curve $y = x^2 - 2x + 3$ at the point $(0, 3)$.

(b) The displacement s of a particle is given at any time t by the relation $s = 2t^3 - 15t^2 + 36t + 70$. Find its (i) initial velocity and (ii) time when velocity is 0.

18. (a) Find the maximum and minimum values of $2x^3 - 6x^2 + 18x + 21$.

(b) The radius of a spherical balloon is increased by 1%. Find the approximate percentage increase in its surface area.
