



* 6017 *

C16-C/CM-102

6017

BOARD DIPLOMA EXAMINATION, (C-16)

MARCH/APRIL—2018

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.
(3) Answers should be brief and straight to the point and shall not exceed *five* simple steps.

1. Resolve $\frac{2x-3}{(x-1)(x-2)}$ into partial fractions.

2. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 3 & 8 \\ 7 & 2 \end{pmatrix}$ and $2X = A + B$, then find X .

3. If $A = \begin{pmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{pmatrix}$, then find $(A + B)^T$.

4. If $A + B = 45^\circ$, then prove that $(1 + \tan A)(1 + \tan B) = 2$.

5. Prove that $\frac{1 + \cos \theta}{\sin \theta} = \tan \frac{\theta}{2}$.

6. Find the modulus of $\frac{7 - 24i}{3 + 4i}$.

*

7. Find the perpendicular distance of a point (3, 5) from the line $3x + 4y - 26 = 0$.
8. Find the equation of a straight line parallel to $x - 2y - 1 = 0$ and passing through the point (1, 2).
9. Evaluate $\lim_{x \rightarrow 0} \frac{\tan 3x}{\sin 5x}$.
10. If $y = \log \frac{1-x^2}{1+x^2}$, then find $\frac{dy}{dx}$.

PART—B

10×5=50

- Instructions :** (1) Answer *any five* questions.
(2) Each question carries **ten** marks.
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. (a) Solve the equation $2x + 3y + z = 1$, $x + 4y + 2z = 3$ and $4x + y + 3z = 11$ by using Cramer's method.

(b) Show that

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

12. (a) If $\sin x = \sin y = \frac{3}{4}$ and $\sin x = \sin y = \frac{2}{5}$, then prove that

$$8 \cot \frac{x+y}{2} = 15 \cot \frac{x-y}{2}$$

(b) If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$, then prove that

$$x + y + z = xyz$$

13. (a) Solve $2 \sin^2 \theta + 3 \cos \theta - 3 = 0$.

(b) In triangle ABC, if $\frac{1}{a} + \frac{1}{c} = \frac{3}{a+b+c}$, show that $C = 60^\circ$.

- * **14.** (a) Find the equation of the circle passing through the points (0, 0), (1, 2) and (2, 0).
- (b) Find the eccentricity, foci, length of latus rectum and equation of directrices of the ellipse $16x^2 + 9y^2 = 144$.
- 15.** (a) If $y = x^{x^{x^{\dots}}}$, then prove that $\frac{dy}{dx} = \frac{y^2}{x(1 + y \log x)}$.
- (b) Differentiate $e^{\tan^{-1} x}$ with respect to $\tan^{-1} x$.
- 16.** (a) If $y = \sin(\log x)$, show that $x^2 y_2 + xy_1 - y = 0$.
- (b) If $z = \log(e^x + e^y)$, then prove that $\frac{z}{x} + \frac{z}{y} = 1$.
- 17.** (a) Find the equations of tangent and normal to the curve $Y = x^2 - 6x + 11$ at (6, 11).
- (b) The radius of a sphere is decreasing at the rate of 0.2 cm/sec. Find the rate at which its volume is decreasing when the radius of the sphere is 10 cm.
- 18.** (a) The sum of two numbers is 24. Find the numbers when the sum of their squares is minimum.
- * (b) If an error of 2% is made in measuring the side of a square plate, find % error in its area.
