



C16-EC/CHPC/PET-102

6028

BOARD DIPLOMA EXAMINATION, (C-16)

MARCH/APRIL—2017

DECE—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

$$\frac{1}{(x-8)(x-1)}$$

into partial fractions.

2. If

$$A = \begin{bmatrix} \sec & \tan \\ \tan & \sec \end{bmatrix}$$

find $\det A$.

3. If

$$A = \begin{bmatrix} 2 & 4 \\ 5 & 3 \end{bmatrix}$$

find $A A^T$.

4. Find the value of $\tan 75^\circ$.

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5. Show that

$$\frac{\sin 2A}{1 - \cos 2A} = \tan A$$

6. If $z = 2 - 3i$, then find $z + \bar{z}$ and $z - \bar{z}$.

7. Find the distance between the parallel lines

$$2x - 3y - 5 = 0 \text{ and } 2x - 3y - 9 = 0$$

8. Find the equation of the line passing through the points (1, 2) and (3, 5).

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sin 37x}{\sin 11x}$$

10. Find $\frac{dy}{dx}$, if $y = 3 \tan x + 4 \log x - 7x^2$.

PART—B

10×5=50

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

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

11. (a) If

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$$

then find adjoint of A.

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

$$2x - 3y + z = 1, \quad x + 4y - 2z = 3 \text{ and } 4x + y - 3z = 11$$

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12. (a) If $\cos x = \cos y = \frac{3}{5}$ and $\cos x = \cos y = \frac{2}{7}$, then

show that $21 \tan \frac{x+y}{2} = 10 \cot \frac{x+y}{2} = 0$.

(b) Show that

$$\tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} = \tan^{-1} \frac{6}{17}$$

13. (a) Solve $4 \sin^2 \theta - 8 \cos \theta + 1 = 0$.

(b) In a $\triangle ABC$, show that $a \sin(B - C) = 0$.

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

(b) Find the equation of the rectangular hyperbola whose focus is the point (3, 4) and directrix is the line $x - y - 5 = 0$.

15. (a) Find the derivative of $\cot(e^x - 2x)$ with respect to x .

(b) Differentiate $\tan^{-1}(\log x)$ with respect to $\log(\tan^{-1} x)$.

16. (a) Find $\frac{d^2y}{dx^2}$ if $x = a \cos^3 \theta$ and $y = b \sin^3 \theta$.

(b) Verify Euler's theorem for the function $z = ax^2 + 2hxy + by^2$.

17. (a) Find the equations of tangent and normal to the curve $y = 3x^2 - 2x + 5$ at the point (2, 1).

(b) The volume of a sphere is increasing at the rate of $400 \text{ cm}^3/\text{sec}$. Find the rate of increase of its radius and its surface area at the instant when the radius of the sphere is 40 cm.

18. (a) The sum of two numbers is 24. Find the numbers when the sum of their squares is minimum.

(b) The pressure p and volume v of a gas are connected by the relation $pv^{1.4} = \text{constant}$. Find the percentage increase in p if v is decreased by 1%.
