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C16-EC/CHPC/PET-102

6028

BOARD DIPLOMA EXAMINATION, (C-16)

OCT/NOV—2018

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.

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

1. Resolve $\frac{x^4}{(x-2)(x-7)}$ into partial fractions.

2. If $A = \begin{pmatrix} 9 & 1 \\ 4 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 5 \\ 6 & 11 \end{pmatrix}$, then find X such that $3A - 5B - 4X = 0$.

3. If $A = \begin{pmatrix} \sec & \tan \\ \tan & \sec \end{pmatrix}$, find $\det A$.

4. Prove that $\sin^2 45^\circ - \sin^2 15^\circ = \frac{\sqrt{3}}{4}$.

5. If $x = \frac{1}{2\cos\theta}$, then show that $x^2 - \frac{1}{x^2} = 2\cos 2\theta$.

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6. Express $\sqrt{3} + i$ in modulus amplitude form.
7. Find the angle between the lines $2x + y - 3 = 0$ and $x + y - 2 = 0$.
8. Find the equation of the line passing through the points $(1, -2)$ and $(-2, 3)$.
9. Evaluate $\lim_{\theta \rightarrow 0} \frac{1 - \cos 2\theta}{\sin 2\theta}$.
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.

(3) All dimensions are in mm.

11. (a) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is a symmetric matrix, then find x .

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

$$x + y + z = 3, x - 2y + 3z = 4 \text{ and } x + 4y - 9z = 6$$

12. (a) Show that $\frac{\sin^2 A}{\sin A \cos A} = \frac{\sin^2 B}{\sin B \cos B} \tan A = \tan B$.

(b) If $\cos^2 x + \cos^2 y + \cos^2 z = 2$, then show that $x^2 + y^2 + z^2 = 2xyz$.

13. (a) Solve $\cos \theta + \sqrt{3} \sin \theta = 1$.

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

14. (a) Find ^{*} the center and radius of the circle $3x^2 + 3y^2 - 5x - 6y - 4 = 0$.

(b) Find the center, lengths of axes, vertices, eccentricity, foci, directrices, latera recta and length of latus rectum of the ellipse represented by $4x^2 - 9y^2 = 36$.

15. (a) Find $\frac{dy}{dx}$, if $y = x^{\tan x}$.

(b) If $y = ae^x + be^{-x}$, then show that $\frac{d^2y}{dx^2} - y = 0$.

16. (a) If $x = a(\sin u)$, and $y = a(1 - \cos u)$ find $\frac{dy}{dx}$

(b) If $u = \tan^{-1} \frac{x^3 - y^3}{x - y}$, prove that $x \frac{u}{x} - y \frac{u}{y} = \sin 2u$.

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

(b) The volume of a cube increases at a rate of $0.3 \text{ cm}^3 / \text{min}$ at the instant when the edge is 20 cm long. Find the rate at which the surface area changes.

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

(b) Find the approximate value of $\sqrt[3]{127}$.
