6028

C16-EC/CHPC/PET-102

# 6028

## BOARD DIPLOMA EXAMINATION, (C-16)

## MARCH/APRIL—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 steps.

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

**2.** If $A = \begin{bmatrix} a & b \\ -b & a \end{bmatrix}$ and $B = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$, then find $AB$.

**3.** If $\begin{vmatrix} 1 & 2 \\ 3 & x \end{vmatrix} = 0$, then find $x$.

**4.** If $A$ is acute and $\cos A = \frac{3}{5}$, then find $\sin 2A$, $\cos 3A$ and $\tan 2A$.

**5.** Find the modulus of $1 + i\sqrt{3}$ and also write its conjugate.

**6.** If $A + B = \frac{\pi}{4}$, then show that $(1 + \tan A)(1 + \tan B) = 2$.

7. Find the value of $x$ if the slope of the line joining two points (2, 5) and $(x, 3)$ is 2.

8. Find the perpendicular distance from the point $(2, -1)$ to the line $3x + 4y + 5 = 0$.

9. Evaluate $\underset{\theta \to 0}{\text{Lt}} \dfrac{\text{cosec}\,\theta - \cot\theta}{\theta}$.

10. Find $\dfrac{dy}{dx}$, if $y = \sqrt{1 + \sin 2x}$.

**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)* If

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

then find $(AB)^T$.

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

$x + 2y - z = -1$, $3x - y - 2z = 5$ and $x - y - 3z = 0$

12. *(a)* Show that

$$\frac{\sin 5A - \sin 3A}{\cos 3A - \cos 5A} = \cot 4A$$

*(b)* Show that

$$\tan^{-1}\left(\frac{2}{3}\right) + \tan^{-1}\left(\frac{3}{4}\right) = \cot^{-1}\left(\frac{6}{17}\right)$$

**13.** *(a)* Solve $\sin\theta + \cos\theta = \sqrt{2}$.

*(b)* In a $\Delta ABC$, show that $\Sigma(b+c)\cos A = a+b+c$.

**14.** *(a)* Find the centre and radius of the circle $3x^2 + 3y^2 - 12x + 6y + 11 = 0$.

*(b)* Find the centre, vertices, lengths of axes, length of Latera recta, eccentricity, foci and the equations of Latera recta and directrices of the ellipse $4x^2 + 9y^2 = 36$.

**15.** *(a)* Find the derivative of $\sin^{-1}(3x - 4x^3)$, w.r.t. $x$.

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

**16.** *(a)* If $u = x^2 + y^2 + xy$, then find $\frac{\partial u}{\partial x}$, $\frac{\partial u}{\partial y}$, $\frac{\partial^2 u}{\partial x\,\partial y}$ and $\frac{\partial^2 u}{\partial y \partial x}$.

*(b)* If $y = \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x + \ldots \infty}}}}$ times, then find $\frac{dy}{dx}$.

**17.** *(a)* Find the lengths of tangent, normal subtangent and subnormal for the curve $y = x^3 - 3x + 2$ at the point (0, 2).

*(b)* A particle is moving along a straight line according to the law $s = 2t^3 - 3t^2 + 15t + 18$ ($t$ in sec). Find its velocity when its acceleration is zero.

**18.** *(a)* Find the maximum and minimum values of $4x^3 - 18x^2 + 24x - 7$.

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

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