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 $\dfrac{1}{(x-3)(x-1)}$ into partial fractions.

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

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

4. If A is acute and $\cos A = \dfrac{3}{5}$, 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 $A + B = \dfrac{\pi}{4}$, 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 $\underset{0}{\text{Lt}} \dfrac{\text{cosec} \ \ \text{cot}}{}$.

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

<div align="center">

PART—B 10×5=50

</div>

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

$$A \quad \begin{matrix} 1 & 2 & 4 \\ 2 & 1 & 3 \\ 0 & 1 & 2 \end{matrix} \quad \text{and } B \quad \begin{matrix} 1 & 2 & 1 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{matrix}$$

then find $(AB)^T$.

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

$x \ 2y \ z \ 1,\ 3x \ y \ 2z \ 5 \text{ and } x \ y \ 3z \ 0$

12. *(a)* Show that

$$\dfrac{\sin 5A \ \sin 3A}{\cos 3A \ \cos 5A} \ \cot 4A$$

(b) Show that

$$\tan^{1} \dfrac{2}{3} \quad \tan^{1} \dfrac{3}{4} \quad \cot^{1} \dfrac{6}{17}$$

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

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

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 $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$.

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

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

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.

★ ★ ★