6035

BOARD DIPLOMA EXAMINATION, (C–16)

OCT/NOV—2018

DEEE—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

$$\frac{4}{(x-5)(x-2)}$$

into partial fractions.

2. If

$$A + B = \begin{bmatrix} 2 & 3 & 1 \\ 6 & 1 & 5 \end{bmatrix} \text{ and } A - B = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 3 \end{bmatrix}$$

then find A and B.

3. Find the determinant of the matrix $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$

4. Prove that

$$\tan 8A - \tan 5A - \tan 3A = \tan 8A \tan 5A \tan 3A.$$

5. Prove that $\sin x \sin(60 - x)\sin(60 + x) = \dfrac{1}{4}\sin 3x.$

6. Find the real and imaginary parts of $\dfrac{4 - 2i}{1 - 2i}.$

7. Find the perpendicular distance of the point $(1, -2)$ from the line $x + 2y + 5 = 0.$

8. Find the equation of the straight line passing through the point $(3, -4)$ and parallel to the line $3x + 5y + 21 = 0.$

9. Find

$$\lim_{\theta \to 0} \frac{1 - \cos\theta}{\theta^2}$$

10. Find $\dfrac{dy}{dx}$, if $y = \dfrac{ax + b}{cx + d}.$

PART—B   10×5=50

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

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

11. *(a)* Solve the equations $2x + y + 3z = 9, x + y + z = 6, x - y + z = 2$ by using Cramer's method.

(b) Show that

$$\begin{vmatrix} a + b + 2c & a & b \\ c & b + c + 2a & b \\ c & a & c + a + 2b \end{vmatrix} = 2(a + b + c)^3$$

12. *(a)* Prove that

$$\frac{\cos A + \cos 3A + \cos 5A + \cos 7A}{\sin A + \sin 3A + \sin 5A + \sin 7A} = \tan 2A$$

(b) Prove that

$$\sin^{-1}\frac{4}{5} + \sin^{-1}\frac{5}{13} = \cos^{-1}\frac{16}{65}$$

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

(b) If $a\cos A = b\cos B$, prove that ABC is either isosceles or right angled.

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14. *(a)* Find the equation of the circle passing through the points (0, 0), (2, 0) and (0, 4).

(b) Find the equation of the rectangular hyperbola whose focus is the point (1, 2) and whose directrix is the line $3x - 4y + 5 = 0$.

15. *(a)* If $y = \sqrt{\cos x + \sqrt{\cos x + \cdots}}$, find $\dfrac{dy}{dx}$.

(b) If $\sin y = x \sin(a + y)$, prove that $\dfrac{dy}{dx} = \dfrac{\sin^2(a + y)}{\sin a}$.

16. *(a)* If $x = t^4 + 5$, $y = t^7 + 6$, find $\dfrac{d^2y}{dx^2}$ at $t = \dfrac{1}{2}$.

(b) If $u = \sin^{-1}\dfrac{x^2 + y^2}{x + y}$, prove that

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u.$$

17. *(a)* Find the lengths of the tangent, normal, subtangent and subnormal for the curve
$$Y = x^3 + 3x^2 - 8x + 2 \text{ at } (3, 4).$$

(b) The volume of a sphere is increasing at a rate of 40 cubic/min. Find the rate of increase of its surface area and radius at the instant when its radius is 10 cm.

18. *(a)* Find the dimensions of a rectangle of maximum area having a perimeter of 36 ft.

(b) The circumference of a circle is measured to be 20 cm with an error of 0·01 cm. Find approximately the percentage error in its area.

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