6035

BOARD DIPLOMA EXAMINATION, (C–16)

MARCH/APRIL—2017

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.

1. Resolve

$$\frac{1}{(x-1)(x-3)}$$

into partial fractions.

2. If

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

then find $2A - 3B$.

3. Using Laplace expansion, evaluate the determinant

$$\begin{vmatrix} 8 & 2 & 5 \\ 2 & 1 & 9 \\ 7 & 4 & 12 \end{vmatrix}$$

4. Show that $\cos^2 15 - \cos^2 75 = \sqrt{3}/2$.

5. If $\cos A = 3/5$, then find $\cos 2A$, $\sin 2A$, $\cos 3A$.

6. Find the multiplicative inverse and additive inverse of $(3 - 2i)(1 - 2i)$.

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

8. Find the angle between the lines $x - 3y - 1 = 0$ and $2x - 3y - 5 = 0$.

9. Evaluate

$$\underset{x \to 5}{Lt} \frac{x^3 - 125}{x - 5}$$

10. Differentiate $\sin (\log x)$ w.r.t. x.

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PART—B   10×5=50

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

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

11. *(a)* Prove that

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

(b) Solve the equations $x + y + z = 6$, $x - y + z = 2$ and $2x + y - z = 1$ by Cramer's method.

12. *(a)* If $\sin x + \sin y = 3/4$ and $\sin x - \sin y = 2/5$, then prove that $8 \cot ((x + y)/2) = 15 \cot ((x - y)/2)$.

(b) Show that $\sin^{-1}(3/5) + \sin^{-1}(5/13) = \cos^{-1}(33/65)$.

13. *(a)* Solve $\sqrt{3}\cos x - \sin x = \sqrt{2}$.

(b) In any triangle ABC, if $A = 60°$ then prove that

$$\frac{c}{a+b} + \frac{b}{a+c} = 1$$

14. *(a)* Find the centre and radius of the circle

$$5x^2 + 5y^2 - 20x + 30y + 1 = 0$$

(b) Find the equation of rectangle hyperbola with focus $(-3, 4)$ and directrix as $4x - 3y + 1 = 0$.

15. *(a)* Differentiate

$$\tan^{-1}\frac{\sin x}{1+\cos x}$$

w.r.t. x.

(b) Differentiate $\sin^m x \cos^n x$ w.r.t. x.

16. *(a)* Find all second-order partial derivatives for

$$u(x, y) = x^3 + 3xy + y^3$$

(b) Differentiate $\cos^{-1}(4x^3 - 3x)$ w.r.t. $\sin^{-1} x$.

17. *(a)* Find the length of the tangent, normal, sub-tangent and sub-normal to the curve $y = 2x^2 - 4x + 5$ at the point $(3, -1)$.

(b) A particle is moving along a line whose movement is governed by $S = t^2 + 6t + 8$ (t in sec). Find the velocity and acceleration at $t = 2$ sec. Also find the initial velocity.

18. *(a)* The sum of two numbers is 10. Find them so that the sum of their squares is minimum.

(b) Find approximately the value of $\sqrt{82}$ using derivatives.

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