4015

BOARD DIPLOMA EXAMINATION, (C–14)
APRIL/MAY—2015
DCE—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) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Resolve $\dfrac{x-4}{(x-2)(x-3)}$ into partial fractions.

2. If $A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 2 & 1 \\ 4 & 3 & 2 \end{pmatrix}$, find $2A - 3B$.

3. Find the value of $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$.

4. Show that $\tan 8A - \tan 5A - \tan 3A = \tan 8A \tan 5A \tan 3A$.

5. Prove that $\dfrac{\sin 2\theta}{1 - \cos 2\theta} = \cot \theta$.

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

7. Find the perpendicular distance from the point (3, 2) to the line $4x+5y+6=0$.

8. Find the equation of the circle with centre (2, –3) and radius 4.

9. Evaluate : $\lim\limits_{\theta \to 0} \dfrac{1-\cos\theta}{\sin\theta}$

10. Differentiate $x^2 e^x$ with respect to 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.

                (3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. *(a)* If $A = \begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & 1 & 0 \end{pmatrix}$, compute $A^2 - 5A + 6I$, where I is the unit matrix of order 3.

     (b) Solve the following system of equations by using matrix inversion method :

         $x+2y+3z=6,\ 2x+4y+z=7,\ 3x+2y+3z=8$

12. *(a)* If $A+B+C=180°$, prove that

         $\cos 2A + \cos 2B + \cos 2C = -1 - 4\cos A \cos B \cos C$

     (b) If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \pi$, show that $xyz = x+y+z$.

13. *(a)* Solve $\sin 5\theta = \sin\theta = \sin 3\theta$.

(b) In any triangle ABC, prove that if $a\cos A = b\cos B$, then the trianlge is either isosceles or right angled.

14. *(a)* Find the equation of the parabola whose axis is parallel to x-axis and which passes through the points $(2, 0)$, $(0, 4)$ and $(-1, 2)$.

(b) Find the equation of the ellipse whose focus is $(1, -1)$, directrix is the line $x - y + 3 = 0$ and eccentricity is $\dfrac{1}{2}$.

15. *(a)* If $y = (\sin x)(\log x)$, find $\dfrac{dy}{dx}$.

(b) Find $\dfrac{dy}{dx}$, if $y = x^{x^{x\dots \text{ terms}}}$.

16. *(a)* Differentiate $\sin x$ with respect to e^x.

(b) If $y = \log(x + \sqrt{1 + x^2})$, then prove that $(1 + x^2)y_2 + xy_1 = 0$.

17. *(a)* Find the equations of tangent and normal to the curve $y = x^2 + 4x + 10$ at $(2, 2)$.

(b) A circular plate of metal expands by heat so that its radius increases at the rate of $0\cdot01$ cm/sec. What rate is the surface area increasing when the radius is 2 cm?

18. *(a)* A wire of length 40 cm is bent so as to form a rectangle. Find the maximum area that can be enclosed by the wire.

(b) If there is an error of 1% in measuring the side of a square plate, find the percentage error in its area.

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