



C-14-C/CM-102

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 $\frac{x^4}{(x-2)(x-3)}$ 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 $\frac{\sin 2}{1 - \cos 2} = \cot$.

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 6. Find the real and imaginary parts of $\frac{4 - 2i}{1 - 2i}$.
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 : $\lim_{x \rightarrow 0} \frac{1 - \cos x}{\sin x}$
10. Differentiate $x^2 e^x$ with respect to x .

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 $A = \begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & 1 & 0 \end{pmatrix}$, 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 :

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

12. (a) If $A + B + C = 180^\circ$, 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 $\sin 5 = \sin 3$.
- (b) In any triangle ABC , prove that if $a \cos A = b \cos B$, then the triangle 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 $\frac{1}{2}$.
15. (a) If $y = (\sin x)(\log x)$, find $\frac{dy}{dx}$.
- (b) Find $\frac{dy}{dx}$, if $y = x^{x^{x^{\dots}}}$ 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 0.01 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.
