



C16-C-102/C16-CM-102

6017

BOARD DIPLOMA EXAMINATION, (C-16)

OCT/NOV—2018

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) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Resolve $\frac{1}{(x-4)(x-9)}$ into partial fractions.

2. If $A = \begin{pmatrix} 2 & 3 \\ 5 & 1 \end{pmatrix}$, then find $A^{-1} A^T$.

3. 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 $2A - 3B$.

4. If $\tan A = \frac{5}{6}$ and $\tan B = \frac{1}{11}$, show that $A - B = \frac{\pi}{4}$.

5. Show that $\frac{\sin 2\theta}{1 - \cos 2\theta} = \cot \theta$.

6. Find the modulus of the complex number $(3 - 4i)(4 - 3i)$.
7. Find the equation of the straight line passing through the point $(0,1)$ and perpendicular to $2x - 3y - 5 = 0$.
8. Find the distance between two parallel lines $3x - 4y - 5 = 0$ and $3x - 4y - 2 = 0$.
9. Evaluate $\lim_{x \rightarrow 0} \frac{\operatorname{cosec} x - \cot x}{x}$.
10. Find $\frac{dy}{dx}$ if $y = \sec x + \log x + 5e^x$.

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

$$A = \begin{pmatrix} 2 & 3 & 4 \\ 5 & 7 & 9 \\ 2 & 1 & 1 \end{pmatrix} \text{ and } B = \begin{pmatrix} 4 & 0 & 5 \\ 1 & 2 & 0 \\ 0 & 3 & 1 \end{pmatrix}$$

then verify that $(AB)^T = B^T A^T$.

(b) Solve the following equations by using Cramer's rule :
 $x + y + z = 2$, $2x - 3y + 4z = 4$ and $3x + y + z = 8$.

12. (a) Show that $\sin A + \sin(120^\circ - A) + \sin(120^\circ + A) = 0$.

(b) Show that $\sec^{-1} \frac{5}{4} + \tan^{-1} \frac{5}{12} = \cot^{-1} \frac{33}{56}$.

13. (a) Solve $\sin 7^\circ + \sin 4^\circ + \sin \theta = 0$.

(b) In any $\triangle ABC$ show that $a \cos \frac{B+C}{2} = (b+c) \sin \frac{A}{2}$.

- 14.** (a) Find the equation of the circle with $(-5, 1)$ and $(3, -7)$ as the end points of a diameter. Also find the radius and centre of the circle.
- (b) Find the equation of the parabola with focus $(-2, 3)$ and the directrix is the line $2x - 3y - 4 = 0$.
- 15.** (a) Find the derivative of $e^{\tan^{-1} x}$ with respect to $\tan^{-1} x$.
- (b) If $y = x^{x^{x^{\dots}}}$ (times) find $\frac{dy}{dx}$.
- 16.** (a) If $x = a(\sin \theta)$ and $y = a(1 - \cos \theta)$, find $\frac{dy}{dx}$.
- (b) If $u = \log(x + y + z)$, then prove that
- $$x \frac{u}{x} + y \frac{u}{y} + z \frac{u}{z} = \frac{3}{x + y + z}.$$
- 17.** (a) Find the equation of the tangent and normal to the curve $y = x^2 - 2x + 1$ at $(1, 2)$.
- (b) A sphere of radius 10 cm shrinks to 9.8 cm. Find the approximate decrease in volume of the sphere.
- 18.** (a) Show that the area of a rectangle of given fixed perimeter is maximum when the rectangle is a square.
- (b) If the radius of a spherical balloon is increased by 0.2%, find the approximate percentage in its volume.

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