



C16-C/CM-102

6017

BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER—2020

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.

1. Resolve $\frac{x}{x^2 - 3x + 2}$ into partial fraction.

2. If $A = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -8 \\ 7 & 2 \end{bmatrix}$, find $2A - 2B$.

3. Evaluate $\begin{vmatrix} p & q & r \\ q & r & p \\ r & p & q \end{vmatrix}$.

4. Prove that, $\frac{\cos 5^\circ - \sin 5^\circ}{\cos 5^\circ + \sin 5^\circ} = \cot 50^\circ$.

5. Prove that, $\sin(45^\circ + \theta) \sin(45^\circ - \theta) = \frac{1}{2} \cos 2\theta$.

6. Find the modulus and multiplicative inverse of $-\sqrt{3} + i$.

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7. Find the intercepts made by the line $3x - 7y = 1$, on the coordinate axes.
8. Find the distance between the parallel lines $5x - y + 5 = 0$ and $5x - y + 11 = 0$.
9. Evaluate $\lim_{\theta \rightarrow 0} \frac{\sin 3\theta + \sin 5\theta}{8\theta}$.
10. Differentiate $e^{-3x} \cos x$, w.r.t. x .

PART—B

10×5=50

Instructions : (1) Answer *any five* questions.
 (2) Each question carries **ten** marks.

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

(b) Find the inverse of the matrix $\begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -4 \\ 1 & 2 & 1 \end{bmatrix}$.

12. (a) Prove that, $\cos 20^\circ - \cos 40^\circ - \cos 80^\circ = 0$.

(b) If $\cot^{-1} \frac{1}{x} + \cot^{-1} \frac{1}{y} + \cot^{-1} \frac{1}{z} = \frac{\pi}{2}$, then show that $xy + yz + zx = 1$.

13. (a) Solve the equation $2\sin^2 \theta - \sin \theta - 1 = 0$.

(b) Solve the triangle ABC , if $\angle B = 45^\circ$, $a = \sqrt{3} + 1$ and $\angle C = 60^\circ$.

14. (a) Find the equation of the circle with $(1, -1)$ and $(2, 3)$ as the extremities of the diameter.

(b) Find the centre, vertices, eccentricity, foci and length of latus rectum of the hyperbola $9y^2 - 4x^2 = 36$.

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15. (a) If $y = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$, then find $\frac{dy}{dx}$.

(b) Find $\frac{dy}{dx}$, if $y = (\sin x)^x$.

16. (a) If $x = b \cos \theta$, $y = a \sin \theta$, find $\frac{d^2y}{dx^2}$.

(b) If $(x, y) = x^2 + y^2 + 6xy$, then find $\frac{\partial^2 u}{\partial x^2}$, $\frac{\partial^2 u}{\partial y^2}$, $\frac{\partial^2 u}{\partial x \partial y}$ and $\frac{\partial^2 u}{\partial y \partial x}$.

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

(b) A circular path of oil spreads on water so that its area is increasing at the rate of 5 sqcm/sec. How fast is the radius increasing when its radius is 3 cm?

18. (a) The sum of two numbers is 36. Find them so that their product is maximum.

(b) The radius of a spherical balloon is increased by 2%. Find the approximate percentage increase in its volume. Also find the approximate percentage increase in its surface area.

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