



C16-EC/CHPC/PET-102

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BOARD DIPLOMA EXAMINATION, (C-16)
OCTOBER—2020
DECE—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 $\frac{1}{(x-8)(x+1)}$ into partial fractions.

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

3. Evaluate $\begin{vmatrix} 8 & 2 & 5 \\ 2 & -1 & 9 \\ 7 & 4 & 12 \end{vmatrix}$, using Laplace expansion.

4. If $\tan A = \frac{m}{m+1}$ and $\tan B = \frac{1}{2m+1}$, where A and B are acute angles, then find $A + B$.

5. Prove that $\cos x \cdot \cos(60^\circ - x) \cdot \cos(60^\circ + x) = \frac{1}{4} \cos 3x$.

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6. Find the ^{*} real and imaginary parts of the complex number $(1 + 3i)(2 + i)$.
7. Find the slope of a line passing through the points $A(3, -7)$ and $B(2, -5)$ and also find its equation.
8. Find the equation of the straight line passing through the point $(3, -7)$ and parallel to the line $2x + 3y + 5 = 0$.
9. Evaluate $\lim_{x \rightarrow 4} \left(\frac{x^3 - 64}{x^2 - 16} \right)$.
10. Find the derivative of $x^7 + 7^x + 7x$ with respect to x .

PART—B

10×5=50

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

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

11. Solve the equations

$$x - y + z = 2, 2x + 3y - 4z = -4 \text{ and } 3x + y + z = 8$$

using matrix inversion method.

12. (a) Prove that, $\cos A + \cos(120^\circ + A) + \cos(120^\circ - A) = 0$.

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

13. (a) Solve the equation, $\cot^2 x - 1 = \operatorname{cosec} x$.

(b) In a $\Delta^{le}ABC$ prove that $\sum(a + b)\cos c = 2s$.

14. (a) Find the ^{*} equation of the circle whose center is at the point (2, -3) and radius is 4 units.

(b) Find the center, vertices, eccentricity, foci and length of latus rectum of the ellipse

$$\frac{x^2}{9} + \frac{y^2}{36} = 1$$

15. (a) Find $\frac{dy}{dx}$, if $y = \tan^{-1}\left(\sqrt{\frac{1 - \cos 2x}{1 + \cos 2x}}\right)$.

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

16. (a) If $y = \sin(\log x)$, then show that $x^2 y_2 + x y_1 + y = 0$.

(b) If $u(x, y) = \log(xy + y^2)$, then show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2$.

17. (a) Find the lengths of tangent, normal, sub-tangent and sub-normal to the curve $x^2 + y^2 - 6x - 2y + 5 = 0$, at the point (2, -1).

(b) A circular metal expands by heat so that its radius increases at the rate of 1.5 cm/sec. Find the rate of increase of its area when the radius is 12 cm.

18. (a) Find the maximum and minimum values of $f(x) = 2x^3 - 9x^2 + 12x + 15$.

(b) If time and length of a simple pendulum is given by the equation

$$T = 2\pi\sqrt{\frac{l}{g}}$$

where g is constant. Find the approximate percentage error in the calculated value of T corresponding to an error 0.4% in the value of l .

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