C23-CHPC-CHPP-EE-EEVT-CHOT–102

# 23087

## BOARD DIPLOMA EXAMINATION, (C-23)

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ENGINEERING MATHEMATICS-I

*Time* : 3 hours ] [ *Total Marks* : 80

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## PART—A

3×10=30

**Instructions :** (1) Answer **all** questions.

(DFK TXHVWLRQ FDUULHV three marks

**1.** Find the domain and range of the real function $f(x) = \frac{}{[}$.

**2.** Resolve $\frac{}{x - \quad x -}$ into partial fractions.

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

**4.** Find the determinant of the matrix $\begin{bmatrix} 2 & 1 \end{bmatrix}$

**5.** Show that FRV ž FRV ž VLQ ž VLQ ž

**6.** If WDQ $= -$, then find the value of $\sin 2A$.

**7.** Find the multiplicative inverse of the complex number $(2 - 3i)$.

**8.** Find the equation of the straight line passing through the points (2,3) DQG



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**9.** Evaluate $\lim_{x \to 0} \frac{\sin 3x}{x}$.

**10.** Find the derivative of $x^3 + e^x$ w.r.t. $x$.

## PART—B

10×5=50

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

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

**11.** Solve the system of linear equations $x - y + 3z = 5$, $4x + 2y - z = 0$ and $-x + 3y + z = 5$ using matrix inversion method.

**12.** *(a)* Prove that $\cos\theta + \cos(120° + \theta) + \cos(120° - \theta) = 0$.

*(b)* Prove that $\tan^{-1}\left(\frac{1}{2}\right) - \tan^{-1}\left(\frac{1}{5}\right) = \tan^{-1}\left(\frac{3}{11}\right)$.

**13.** *(a)* Solve $\sqrt{3}\cos\theta - \sin\theta = 1$.

*(b)* Solve $\triangle ABC$ with $a = 1$, $b = \sqrt{2}$, $c = 1$.

**14.** *(a)* Find the equation of the circle passing through the points $(0,0)$, $(2,0)$ and $(0,-3)$.

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

**15.** *(a)* Find the derivative of $x^2 \sin x$ with respect to $x$.

*(b)* Find the derivative of $\sqrt{\tan 3x}$ with respect to $x$.



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**16.** *(a)* If $x = ct$ and $y = \frac{c}{t}$, then find $\frac{dy}{dx}$.

*(b)* If $u(x, y) = \log(x + y)$, then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 1$.

**17.** *(a)* Find the equations of the tangent and normal to the curve $y = x^2 + 2$, at $(0, 2)$.

*(b)* The side of square plate is expanding at the rate 0.3 cm/sec. Find the rate at which its perimeter is increasing when its side is 10 cm.

**18.** *(a)* Find the maximum or minimum value of the function $f(x) = 2x^2 - 3x + 5$.

*(b)* Compute $\Delta y$ if $y = x^3 - 2x$, $x = 3$ and $\Delta x = 0.001$.

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