# 6017

## BOARD DIPLOMA EXAMINATION
## MARCH/APRIL - 2019
## COMMON FIRST YEAR EXAMINATION
## ENGINEERING MATHEMATICS - I

**Time: 3Hours** **Max. Marks : 80**

$PART - A$ $10 \times 3 = 30$

**Instructions:**

- Answer **ALL** questions and each question carries **THREE** marks
- Answers should be brief and straight to the point and shall not exceed **FIVE** simple sentences

(1) Resolve $\dfrac{6-5x}{(x+2)(x-1)}$ into Partial Fractions

(2) If $A = \begin{bmatrix} 3 & 2 & 3 \\ 4 & 5 & 2 \\ 1 & 6 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ then find $(A+B)^T$

(3) Evaluate $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

(4) Prove that $\dfrac{cos\ 15^o - sin\ 15^o}{cos\ 15^o + sin\ 15^o} = \dfrac{1}{\sqrt{3}}$

(5) Prove that $\dfrac{sin\ 2\theta}{1 - cos\ 2\theta} = cot\ \theta$

(6) Find the conjugate of the complex number $\dfrac{3-4i}{2i}$

(7) Find the equation of the straight line passing through the points $(-4,\ 6)$ and $(6,\ 8)$

(8) Find the perpendicular distance of the point $(7,\ -2)$ from the line $9x + 17y - 13 = 0$

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(9) Evaluate $\lim_{\theta \to 0} \left( \frac{sin\ 4\theta + sin\ 2\theta}{sin\ 6\theta} \right)$

(10) Find the derivative of $x^8 cot\ x$ with respect to $x$

$\boxed{PART - B}$ $5 \times 10 = 50$

**Instructions:**

- Answer **ANY FIVE** questions and each question carries **TEN** marks
- The answers should be comprehensive and criteria for valuation is the content but not the length of the answer

(11) (a) Solve the equations $x + y + 4z = 6$, $3x + 2y - 2z = 9$ and $5x + y + 2z = 13$ by Crammer's Rule

(b) Find the adjoint of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 1 \\ 1 & 1 & 2 \end{bmatrix}$

(12) (a) If $cos\ x + cos\ y = \frac{3}{7}$ and $cos\ x - cos\ y = \frac{5}{9}$ then show that $27\ tan\left(\frac{x-y}{2}\right) + 35\ cot\left(\frac{x+y}{2}\right) = 0$

(b) Prove that $Tan^{-1}\left(\frac{3}{4}\right) + Tan^{-1}\left(\frac{3}{5}\right) - Tan^{-1}\left(\frac{8}{19}\right) = \frac{\pi}{4}$

(13) (a) Solve the equation $4\ sin^2\theta + 2\ sin\ \theta - 1 = 0$

(b) In a $\Delta^{le} ABC$ prove that $b\ cos^2\left(\frac{C}{2}\right) + c\ cos^2\left(\frac{B}{2}\right) = s$

(14) (a) Find the equation of the Circle with center at the point $(2,\ -2)$ and passing through the point $(-1,\ 2)$

(b) Find the vertex, focus equation of axis, latus rectum, directrix and length of latus rectum of the Parabola $x^2 = -8y$

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(15) (a) Find $\frac{dy}{dx}$, if $y = sin^{-1}(3x - 4x^3)$

(b) Find $\frac{dy}{dx}$ if $y = x^{sin^{-1}x}$

(16) (a) Find $\frac{d^2y}{dx^2}$, if $x = a\ sec^3\theta$, $y = a\ tan^3\theta$

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

(17) (a) Find the angle between the curves $y^2 = 8x$ and $x^2 = 8y$ at the point $(8,\ 8)$

(b) The edge of a cube is decreasing at the rate of 0.03 $cm/sec$. Find the rate at which the volume is decreasing when the edge is 12 $cm$. Also find the rate of decrease in surface area

(18) (a) Find the maximum and minimum values of $f(x) = 4x^3 - 3x^2 - 18x + 12$ in the interval $\left[-\frac{3}{2},\ \frac{3}{2}\right]$

(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 3% in the value of $l$

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