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 $9x + 17y - 13 = 0$

(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 $x^2 = -8y$

(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