BOARD DIPLOMA EXAMINATION
JUNE - 2019
COMMON FIRST YEAR EXAMINATION
ENGINEERING MATHEMATICS - I

6028

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 $\dfrac{3x-1}{(x-2)(x-3)}$ into Partial Fractions

(2) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$ then find $A^2 - 3A + 2I$ where I is a unit matrix of order 2

(3) Show that $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = abc + 2fgh - af^2 - bg^2 - ch^2$

(4) Prove that $\dfrac{sin(A+B)}{sin\ A \cdot sin\ B} = cot\ A + cot\ B$

(5) Prove that $\dfrac{1 - cos\ \theta + sin\ \theta}{1 + cos\ \theta + sin\ \theta} = tan\left(\dfrac{\theta}{2}\right)$

(6) Find the real and imaginary of parts of the complex number $\dfrac{1-i}{1+i}$

(7) Find the equation of the straight line passing through the points $\left(\dfrac{3}{5},\ 4\right)$ and $\left(3,\ \dfrac{-1}{3}\right)$

(8) Find the equation of the straight line passing through the point $(3,\ -5)$ and parallel to the line $x - 7y + 15 = 0$

(9) Evaluate $\lim_{x\to 0}\left(\frac{x}{1-\sqrt{1-x}}\right)$

(10) Find the derivative of $a^x + x^2 sec\ x$ 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) Solve the equations $2x - y + 3z = 9$, $x + y + z = 6$ and $x - y + z = 2$ using matrix inversion method

(12) (a) Prove that $sin\ 50^o - sin\ 70^o + sin\ 10^o = 0$

(b) Prove that $Cos^{-1}\left(\frac{4}{5}\right) + Cos^{-1}\left(\frac{12}{13}\right) = Cos^{-1}\left(\frac{33}{65}\right)$

(13) (a) Solve the equation $(2\ cos\theta - 1)(cos\ \theta - 1) = 0$

(b) In a $\Delta^{le} ABC$ prove that $\sum sin\ A = \frac{s}{R}$

(14) (a) Find the equation of the Circle with center at the point $(2,\ 3)$ and passing through the point $(-2,\ -1)$

(b) Find the center, vertices, eccentricity, foci and length of latus rectum of the Ellipse $\frac{x^2}{25} + \frac{y^2}{4} = 1$

(15) (a) If $x = a(\theta - sin\ \theta)$, $y = a(1 - cos\ \theta)$ then find $\frac{dy}{dx}$

(b) If $y = \sqrt{sec\ x + \sqrt{sec\ x + \sqrt{sec\ x + \ldots \infty}}}$ then find $\frac{dy}{dx}$

(16) (a) If $y = sin\ \sqrt{x}$ then show that $4xy_2 + 2y_1 + y = 0$

(b) If $u(x,\ y) = x^3 + y^3 + 3x^2y$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3u$

(17) (a) Find the equations of tangent and normal to the curve $y^2 = \frac{x^3}{2a - x}$ at the point $(a,\ a)$

(b) Each side of a square increases at the rate of 0.33 cm/sec. Find the rate at which the area of the square increases when the side is 12 cm. Also find the rate of increase in its perimeter

(18) (a) A wire of length 20 cm is cut into two parts which are bent in the form of a square and circle. Find the least value of the sum of the areas so formed

(b) The radius of a spherical balloon is increased by 1%. Find the approximate percentage increase in its volume. Also find the approximate percentage increase in its surface area