BOARD DIPLOMA EXAMINATION
MARCH/APRIL - 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 $\dfrac{4}{(x-2)(x-5)}$ into Partial Fractions

(2) If $A = \begin{bmatrix} 1 & 3 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$ then find AB and BA

(3) If $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & x \end{bmatrix}$ and $det(A) = 45$ then find the value of x

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

(5) Prove that $sin\ 10^o \cdot sin\ 50^o \cdot sin\ 70^o = \dfrac{\sqrt{3}}{8}$

(6) Find the real and imaginary of parts of the complex number $(3-4i)(5+7i)$

(7) Find the value of x if the slope of the line joining the points $(1,\ -2)$ and $(-2,\ x)$ is $-\dfrac{5}{3}$

(8) Find the equation of the straight line passing through the point $(3,\ -4)$ and perpendicular to the line $5x + 3y - 1 = 0$

(9) Evaluate $\lim_{x\to 1}\left(\dfrac{x^3+3x+2}{x^2+5x+4}\right)$

(10) Find the derivative of $5^x e^x$ 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 $x + -y + z = 2$, $2x + 3y - 4z = -4$ and $3x + y + z = 8$ by Crammer's Rule

(b) Find the adjoint of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$

(12) (a) If $\dfrac{sin(\alpha+\beta)}{sin(\alpha-\beta)} = \dfrac{a+b}{a-b}$ then show that $b\ tan\alpha = a\ tan\beta$

(b) Prove that $Tan^{-1}\left(\dfrac{2}{13}\right) + Tan^{-1}\left(\dfrac{5}{7}\right) = Tan^{-1}\left(\dfrac{79}{81}\right)$

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

(b) In a $\Delta^{le} ABC$ prove that $\sum\left(\dfrac{a^2-b^2}{c^2}\right) sin\ 2C = 0$

(14) (a) Find the equation of the Circle whose center is at the point $(-3,\ 2)$ and radius is 4 units

(b) Find the vertex, focus equation of axis, latus rectum, directrix and length of latus rectum of the Parabola $x^2 = 4y$

(15) (a) If $x = 5(\theta - sin\ \theta)$, $y = 5(1 - cos\ \theta)$ then find $\frac{dy}{dx}$

(b) If $y = \sqrt{tan\ x + \sqrt{tan\ x + \sqrt{tan\ x + \ldots \infty}}}$ then show that $\frac{dy}{dx} = \frac{sec^2 x}{2y - 1}$

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

(b) If $u(x,\ y) = tan^{-1}\left(\frac{x^3 + y^3}{x - y}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = sin\ 2u$

(17) (a) Find the lengths of tangent, normal, sub-tangent and sub-normal to the curve $y = 2x^2 - 4x + 5$ at the point $(3,\ -1)$

(b) The volume of a sphere is increasing at the rate of 0.3 cc/sec. Find the rate of increase of its surface area and radius at the instant when the radius of the sphere is 20 cm

(18) (a) Find the maximum and minimum values of $f(x) = x^3 - 4x^2 + 5x$

(b) Each side of a cube is increased by 0.2%. Find the approximate percentage increase in its volume. Also find the approximate percentage increase in its surface area