6017

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

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

$\boxed{PART - A}$ $10 \times 3 = 30$

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 $\dfrac{1}{x^2(x+2)}$ into Partial Fractions

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

(3) Evaluate $\begin{vmatrix} 4 & 5 & 2 \\ -6 & 2 & 1 \\ -1 & 5 & 1 \end{vmatrix}$ using Laplace Expansion

(4) Prove that $tan(45^o + A) \cdot tan(45^o - A) = 1$

(5) If $cos\ \theta = \dfrac{3}{5}$ then find $cos\ 2\theta$ and $cos\ 3\theta$

(6) Find the multiplicative inverse of the complex number $\dfrac{10}{1+3i}$

(7) Find the equation of the straight line passing through the points $(-4,\ 3)$ and $(3,\ -2)$

(8) Find the point of intersection of the lines $5x - 7y + 1 = 0$ and $2x + 5y - 11 = 0$

(9) Evaluate $\lim_{x \to \infty} \left(\dfrac{2x^2 + 6x + 3}{5x^2 + 7x + 9} \right)$

(10) Find the derivative of $x\ e^x\ cos\ x$ 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 $x + y + z = 3$, $x + 2y + 3z = 4$ and $x + 4y + 9z = 6$ by Crammer's Rule

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

(12) (a) If $sin\ \theta + sin\ \phi = \dfrac{4}{5}$ and $sin\ \theta - sin\ \phi = \dfrac{2}{7}$ then prove that $5\ tan\left(\dfrac{\phi + \theta}{2}\right) + 14\ tan\left(\dfrac{\phi - \theta}{2}\right) = 0$

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

(13) (a) Solve the equation $2\ cos^2 x + 5\ cos\ x + 2 = 0$

(b) In a $\Delta^{le} ABC$ prove that $(a - b)\ tan\left(\dfrac{A + B}{2}\right) = (a + b)\ tan\left(\dfrac{A - B}{2}\right)$

(14) (a) Find the center and radius of the Circle whose equation is $5x^2 + 5y^2 + 30x - 20y + 1 = 0$

(b) Find the equation of the Parabola whose focus is the point $(3,\ 4)$ and directrix is the line $2x - 3y + 4 = 0$

(15) (a) Find $\frac{dy}{dx}$, if $y = sin^{-1}\left(\frac{2x}{1+x^2}\right)$

(b) Find $\frac{dy}{dx}$, if $y = (cos\ x)^{(cos\ x)^{(cos\ x)^{\cdots\infty}}}$

(16) (a) Find $\frac{d^2y}{dx^2}$, if $y = \frac{3x+2}{x-5}$

(b) If $u(x,\ y) = \log\left(\frac{x^4+y^4}{x^2+y^2}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2$

(17) (a) Find the equations of tangent and normal to the curve $x = a(\theta + sin\ \theta)$, $y = a(1 - cos\ \theta)$ at $\theta = \frac{\pi}{2}$

(b) The displacement s of a particle is given at any time t by the relation $s = t^3 - 9t^2 + 24t - 18$. Find its velocity and acceleration when $t = 3\ sec$

(18) (a) Find the maximum and minimum values of $f(x) = 4x^3 - 3x^2 - 18x + 12$

(b) The pressure P and volume V of a gas are connected by the relation $PV^{\frac{1}{4}} = constant$. Find the percentage increase in P if V is decreased by 3%