6035

C16 - EE/CHPP - 102

BOARD DIPLOMA EXAMINATION

JUNE - 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 $\dfrac{6x^2 + 5x - 2}{2x^3 - x^2 - x}$ into Partial Fractions

(2) If $A = \begin{bmatrix} 2 & 1 \\ 3 & 5 \end{bmatrix}$ then find $A^2 + 2A + 3I$

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

(4) Prove that $cos^2 75^o - cos^2 15^o = \dfrac{-\sqrt{3}}{2}$

(5) Show that $sin\ 8\theta = 8\ sin\ \theta\ cos\ \theta\ cos\ 2\theta\ cos\ 4\theta$

(6) Find the modules of the complex number $\dfrac{7+i}{3-4i}$

(7) Find the intercepts made by the line $13x + 7y + 11 = 0$ on the co-ordinate axes

(8) Find the equation of the straight line passing through the point (1, 2) and parallel to the line $3x + 4y - 6 = 0$

(9) Evaluate $\lim_{x\to a}\left(\frac{(x+3)^{\frac{5}{2}}-(a+3)^{\frac{5}{2}}}{x-a}\right)$

(10) Differentiate $e^{3x}sec\ x$ 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 $x+y+z=6$, $x-y+z=2$ and $2x+y-z=1$ using matrix inversion method

(12) (a) Prove that $cos\ 40^o+cos\ 80^o+cos\ 160^o=0$

(b) If $Cot^{-1}\left(\frac{1}{x}\right)+Cot^{-1}\left(\frac{1}{y}\right)+Cot^{-1}\left(\frac{1}{z}\right)=\frac{\pi}{2}$ then show that $xy+yz+zx=1$

(13) (a) Solve the equation $cot\ \theta+cosec\ \theta=\sqrt{3}$

(b) In a $\Delta le ABC$ if $b+c=3a$ then prove that $cot\left(\frac{B}{2}\right)\cdot cot\left(\frac{C}{2}\right)=2$

(14) (a) Find the equation of the circle with $(2,\ 1)$ and $(-4,\ 3)$ as end points of a diameter

(b) Find the center, vertices, eccentricity, foci and length of latus rectum of the Ellipse $\frac{x^2}{4}+\frac{y^2}{36}=1$

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

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

(16) (a) Find $\frac{d^2y}{dx^2}$, if $x = at^2$, $y = 2at$

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

(17) (a) Find the equations of tangent and normal to the curve $x^2 + y^2 - 6x - 2y + 5 = 0$ at the point $(2,\ -1)$

(b) A circular metal expands by heat so that its radius increases at the rate of 1.5 $cm/sec.$ Find the rate of increase of its area when the radius is 12 cm

(18) (a) The sum of two numbers is 12. Find them so that the sum of their squares is minimum

(b) The side of a square plate is increased by 0.1%. Find the approximate percentage increase in its area