

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

6028

Time: 3Hours

Max. Marks : 80

PART - A

10 × 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 $\frac{3x - 1}{(x - 2)(x - 3)}$ 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 $\frac{\sin(A + B)}{\sin A \cdot \sin B} = \cot A + \cot B$

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

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

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

(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 $\lim_{x \rightarrow 0} \left(\frac{x}{1 - \sqrt{1-x}} \right)$

(10) Find the derivative of $a^x + x^2 \sec x$ with respect to x

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 $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = 0$

(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 $y = \sqrt{\sec x + \sqrt{\sec x + \sqrt{\sec x + \dots \infty}}}$ 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