

6002

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

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 $\frac{2x}{(x-4)(x-5)}$ into Partial Fractions

(2) If $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 & 1 \\ -3 & 1 & 2 \end{bmatrix}$ then verify $(A+B)^T = A^T + B^T$

(3) Evaluate $\begin{vmatrix} 0 & y & -z \\ -y & 0 & x \\ z & -x & 0 \end{vmatrix}$

(4) If $A + B + C = 180^\circ$ then show that $\tan 2A + \tan 2B + \tan 2C = \tan 2A \tan 2B \tan 2C$

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

(6) Find the modulus of the complex number $\frac{7+5i}{3-4i}$

(7) Find the slope of a line passing through the points $A(3, -7)$ and $B(2, -5)$ and also find its equation

(8) Find the distance between the parallel lines $11x - 3y + 39 = 0$ and $11x - 3y + 26 = 0$

(9) Evaluate $\lim_{x \rightarrow 0} \left(\frac{\sqrt{4+x} - \sqrt{4-x}}{x} \right)$

(10) Differentiate $\cos(e^x + x^3)$ 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 $x + 2y + 3z = 6$, $3x - 2y + z = 2$ and $4x + 2y + z = 7$ using matrix inversion method

(12) (a) Prove that $\frac{\sin 85^\circ - \sin 35^\circ}{\cos 35^\circ - \cos 85^\circ} = \frac{1}{\sqrt{3}}$

(b) Prove that $\tan^{-1}\left(\frac{m}{n}\right) - \tan^{-1}\left(\frac{m-n}{m+n}\right) = \frac{\pi}{4}$

(13) (a) Solve the equation $\tan^2 x + \cot^2 x = 2$

(b) In a $\Delta^{le} ABC$ prove that $\sum a \cos^2\left(\frac{A}{2}\right) = s + \frac{\Delta}{R}$

(14) (a) Find the equation of the Circle with center at the point $(-3, 4)$ and passing through the Origin

(b) Find the center, vertices, eccentricity, foci and length of latus rectum of the Ellipse $\frac{x^2}{16} + \frac{y^2}{4} = 1$

(15) (a) Differentiate $\sin^{-1}(2x\sqrt{1-x^2})$ with respect to $\sin^{-1}x$

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

(16) (a) If $y = a \sin 2x + b \cos 2x$ then show that $\frac{d^2y}{dx^2} - 4y = 0$

(b) If $u(x, y) = \tan^{-1}(x^2 + xy + y^2)$, 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 $y = x^2 + 2x + 1$ at the point (1, 4)

(b) The volume of a sphere is increasing at the rate of 10 *cub. inch/sec.* Find the rate of increase of its surface area and radius at the instant when the radius of the sphere is 10 *inch*

(18) (a) Find the dimension of a rectangle of maximum area having a perimeter 20 *ft.*

(b) Find an approximate value of $\sin 61^\circ$ given that $1^\circ = 0.0175 \text{ radians}$

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