

6002

BOARD DIPLOMA EXAMINATION
MARCH/APRIL - 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 $\frac{x-4}{(x-2)(x-3)}$ into Partial Fractions

(2) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$ then verify $(A+B)^T = A^T + B^T$

(3) Evaluate $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ if ω is a complex cube root of unity

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

(5) Prove that $\cos^4 A - \sin^4 A = \cos 2A$

(6) Find the real and imaginary of parts of the complex number $\frac{1+3i}{1+i}$

(7) Find the equation of the line passing through the point (7, 9) and having slope -3

(8) Find the equation of the straight line passing through the point $(-4, 3)$ and perpendicular to the line $3x + y - 31 = 0$

(9) Evaluate $\lim_{x \rightarrow 1} \left(\frac{x^2 + 5x - 6}{x^2 + x - 2} \right)$

(10) Differentiate $\frac{1 - e^x}{1 + e^x}$ 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 $2x + 8y + 5z = 5$, $x + y + z = -2$ and $x + 2y - z = 2$ using matrix inversion method

(12) (a) Prove that $\cos A + \cos(120^\circ + A) + \cos(120^\circ - A) = 0$

(b) Prove that $\tan^{-1}\left(\frac{3}{5}\right) + \tan^{-1}\left(\frac{3}{4}\right) = \tan^{-1}\left(\frac{27}{41}\right)$

(13) (a) Solve the equation $7 \sin^2 x + 3 \cos^2 x = 4$

(b) In a $\Delta^{le} ABC$ prove that $\sum a^3 \sin(B - C) = 0$

(14) (a) Find the equation of the Circle with center at the point (1, 2) and whose tangent is the line $3x - 4y - 1 = 0$

(b) Find the center, vertices, eccentricity, foci and length of latus rectum of the Ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$

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

(b) Find $\frac{dy}{dx}$ if $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$

(16) (a) If $y = \sin(\log x)$ then show that $x^2y_2 + xy_1 + y = 0$

(b) If $u(x, y) = \sin^{-1}\left(\frac{x^4 + y^4}{x + y}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3 \tan u$

(17) (a) Find the equations of tangent and normal to the curve $x = a(\theta - \sin \theta)$,
 $y = a(1 - \cos \theta)$ at $\theta = \frac{\pi}{4}$

(b) The displacement s of a particle is given at any time t by the relation
 $s = t^3 + 25t$. Find its velocity when the acceleration is 0

(18) (a) Find the maximum and minimum values of $f(x) = 4x^3 + 9x^2 - 12x + 1$

(b) If time and length of a simple pendulum is given by the equation $T = 2\pi\sqrt{\frac{l}{g}}$ where g is constant.
Find the approximate percentage error in the calculated value of T corresponding to an error 1% in the value of l