

6017

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 $\frac{1}{x^2(x+2)}$ 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 $\tan(45^\circ + A) \cdot \tan(45^\circ - A) = 1$

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

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

(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 $\lim_{x \rightarrow \infty} \left(\frac{2x^2 + 6x + 3}{5x^2 + 7x + 9} \right)$

(10) Find the derivative of $x e^x \cos x$ 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) (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 $\sin \theta + \sin \phi = \frac{4}{5}$ and $\sin \theta - \sin \phi = \frac{2}{7}$ then prove that $5 \tan \left(\frac{\phi + \theta}{2} \right) + 14 \tan \left(\frac{\phi - \theta}{2} \right) = 0$

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

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

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

(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 $2x - 3y + 4 = 0$

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

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

(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 $PV^{\frac{1}{4}} = \text{constant}$. Find the percentage increase in P if V is decreased by 3%

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