



4002

C14- A/AA/AEI/CH/ CHST/C/ CM/ EC/
EE/FW/M/MET/MNG/ IT/TT/PKG-102

4002

BOARD DIPLOMA EXAMINATION, (C-14)
OCTOBER/NOVEMBER-2018
FIRST YEAR EXAMINATION

ENGINEERING MATHEMATICS – I

Time : 3 Hours]

[Total Marks: 80

PART-A

4X10=40

- Instructions :**
1. Answer **All** questions.
 2. Each question carries **four** marks.
 3. Answer should be brief and straight to the point and shall not exceed five simple sentences.

1. (a) If $\frac{1}{(x+1)(x-3)} = \frac{A}{x+1} + \frac{B}{x-3}$ find the values of A, B

* (b) Resolve $\frac{1}{(x+1)(x-3)}$ into partial fraction

2. (a) Evaluate $\begin{vmatrix} 1 & 3 & 0 \\ -2 & 5 & 4 \\ 8 & 3 & -1 \end{vmatrix}$

(b) If $A = \begin{bmatrix} 3 & 4 & 2 \\ 1 & 0 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 2 & 2 \\ 1 & -3 & 5 \end{bmatrix}$ find $2A-B$

3. (a) If $A = \begin{bmatrix} 1 & 3 & 5 \\ -1 & 0 & 2 \\ 0 & 5 & 7 \end{bmatrix}$ find $A - A^T$

(b) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$ find AB

4. (a) Show that $\tan(45 + \theta) = \frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta}$

(b) Show that $\cos 48^\circ \sin 18^\circ - \sin 48^\circ \cos 18^\circ = -\frac{1}{2}$

5. (a) Write the formulae for $\sin 3A$, $\cos 2A$.

(b) Show that $\frac{1+\cos 2A}{\sin 2A} = \cot A$.

6. (a) Find the real and imaginary parts $(3+4i)(4-3i)$.

(b) Find the multiplicative inverses of $4+3i$

7. (a) Find the equation of the straight line passing through the point $(2, -5)$ and perpendicular to the line $7x + 2y - 1 = 0$

(b) Find the angle between the lines $2x - y + 3 = 0$ and $x + y - 2 = 0$

8. (a) Find the equation of the point circle with center $(3, 2)$

(b) Find the center and radius of the circle $x^2 + y^2 + 4x - 6y + 4 = 0$

9. (a) Evaluate $\lim_{x \rightarrow 0} \frac{\sin px}{\sin qx}$

(b) Evaluate $\lim_{x \rightarrow 0} \frac{x^2 - 9}{x - 3}$

10. (a) Find the derivative of $(3\sqrt{x} + \tan^{-1} x + e^x)$

(b) Find $\frac{d}{dx}(x^3 \tan x)$

PART-B

10X4=40

- Instructions :**
1. Answer any **Four** questions.
 2. Each question carries **ten** marks.
 3. Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

11. (a) Solve $\begin{vmatrix} x+1 & 2 & 3 \\ 1 & x+2 & 3 \\ 1 & 2 & x+3 \end{vmatrix} = 0$

(b) Using matrix inversion method solve the following equations

$$x + y + z = 6, \quad x - y + z = 2, \quad 2x + y - z = 1$$

12. (a) If $A + B + C = 180^\circ$ prove that $\sin 2A - \sin 2B - \sin 2C = -4 \sin A \cos B \cos C$

(b) Prove that $\tan^{-1} \left(\frac{3}{4}\right) + \cot^{-1} \left(\frac{12}{5}\right) = \tan^{-1} \left(\frac{56}{33}\right)$

13. (a) Solve $\sin\theta + \sin 5\theta = \sin 3\theta$
 (b) Solve the triangle $b=1, c=\sqrt{3}, A = 30^\circ$
14. (a) Find the equation of rectangular hyperbola whose focus is $(-1, -3)$ and directrix is the line $x + 2y + 7 = 0$
 (b) Find the equation of parabola whose directrix is parallel to x-axis and which passes through the points $(0,2), (-1, 4), (2,4)$
15. (a) Find the derivative of $\frac{\sin x}{1+\cos x}$ w.r.t.x.
 (b) Find the derivative of $\sin^{-1}(3x - 4x^3)$ w.r.t.x. .
16. (a) Find $\frac{dy}{dx}$ if $x = a(\theta - \sin\theta), y = a(1 + \cos\theta)$
 (b) If $u = x^2 + y^2 + z^2$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 2u$
17. (a) Find the lengths of the tangent, normal, sub-tangent and subnormal for the curve $y = x^2 + 2x + 1$ at $(1, 4)$
 (b) A stone projected vertically upwards is governed by the equation $S = 96t - 16t^2$. Find its initial velocity, its velocity at the end of 2 seconds, its acceleration at the end of first second the greatest height attained by it. (S is in mts)
18. (a) Find the maximum and minimum values of $2x^3 - 9x^2 + 12x + 5$. .
 (b) The time T of a complete oscillation of a simple pendulum of length l is given by $T = 2\pi \sqrt{\frac{l}{g}}$ where g is a constant. Show that the approximate percentage error in the calculated value of T corresponding to an error of 4% in the value of l is 2%
