C16-A/AA/CHST/C/CM/EC/EE/M/AEI/
MNG/IT/PKG-102

5002

BOARD DIPLOMA SUPPLEMENTARY (INSTANT) EXAMINATION, (C-16)

JUNE - 2019

FIRST YEAR (COMMON) EXAMINATION

ENGINEERING MATHEMATICS - I

Time : **3** Hours] [Total Marks : **80**

PART - A **2×15=30**

Instructions : *(1) Answer any **15** questions.*
*(2) Each question carries **2** marks.*
(3) Answer should be brief and straight to the point and shall not exceed five simple sentences.

1 Find the value of $\log_4 256$.

2 Define proper fraction and give an example.

3 Resolve $\frac{1}{(x-5)(x+7)}$ into partial fractions.

4 If $A = \begin{bmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{bmatrix}$ then det A = ?

5 State any two types of matrices.

6 If $A = \begin{pmatrix} 2 & -4 \\ -5 & 3 \end{pmatrix}$ then find $A + A^T$.

7 Write formulae for $\sin(A+B)$ and $\cos(A+B)$.

8 Simplify $\frac{\sin 2x}{1+\cos 2x}$.

9 Find the value of $4\cos^3 20 - 3\cos 20$.

10 State Sine rule.

11 Find the modulus of $\frac{4+7i}{7+4i}$.

12 Find the amplitude of $\sqrt{3}+i$.

13 Find the intercepts made by the line $3x - 2y - 2 = 0$ on the coordinate axes.

14 Find the equation of the straight line passing through the points (0, 1) and (3, –4).

15 Find the equation of the point circle with centre (5, –2).

16 Find centre and radius of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$.

17 Evaluate $\lim_{x\to 0} \frac{\sin 33x}{\tan 11x}$.

18 Evaluate $\lim_{x\to 0} \frac{e^{4x}-1}{x}$.

19 Find the derivative of $3\tan x - 4\log x - 7x^3 + 9$ w.r.t. 'x'.

20 Find the derivative of $\log(\sin x)$, w.r.t. 'x'.

PART - B **10×5=50**

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

21 Solve the following system of equations using Cramer's rule :

$x + y + 3z = 6$, $x + y + z = 2$ and $2x - y + 3z = 9$.

22 (a) Prove that $\frac{\cos 3A + \cos A}{\sin 3A + \sin A} = \cot 2A$.

(b) Prove that $\cos 70° + \cos 50° - \cos 10° = 0$.

23 (a) Prove that $2 \tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7} = \frac{\pi}{4}$.

(b) If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$ then prove that

$x + y + z = xyz$.

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

(b) Find the equation of the circle with (2, 3) and (6, 9) as the end points of a diameter.

25 (a) Find $\frac{dy}{dx}$ if $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x \ldots\ldots\infty}}}}$.

(b) If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$.

26 (a) If $y = x^x$ then find $\frac{dy}{dx}$.

(b) Find $\frac{dy}{dx}$, if $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$.

27 (a) Find the equations of Tangent and Normal to the curve $y = x^2 - 2x - 3$ at $(0, -3)$.

(b) Find the lengths of the Tangent, Normal, Sub-tangent and Sub-normal for the curve $y = x^2 + 2x + 1$ at $(1, 4)$.

28 (a) Find the maximum and minimum values of $4x^3 + 9x^2 - 12x + 12$.

(b) The sum of two numbers is 24. Find the numbers when the sum of their squares is a minimum.
