7002

C20-COMMON–**102**

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BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

FIRST YEAR (COMMON) EXAMINATION

ENGINEERING MATHEMATICS – I

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

PART—A

3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

1. Find the domain and range of the function defined by $f(x) = 5x - 3$.

2. Resolve $\frac{1}{(x+2)(x-3)}$ into partial fractions.

3. If $A = \begin{bmatrix} 1 & -3 \\ -2 & 1 \end{bmatrix}$, then compute $A^2 - 3A$.

4. If $A + B = \frac{\pi}{4}$, then prove that $(1 + \tan A)(1 + \tan B) = 2$.

5. Prove that $\frac{\sin 2A}{1 + \cos 2A} \cdot \frac{\cos A}{1 + \cos A} = \tan \frac{A}{2}$.

6. Find the real and imaginary parts of the complex number $(3 - 4i)(2 + 3i)$.

7. Find the equation of the line passing through the points (1, 2) and (3, –4).

8. Evaluate $\lim_{x \to 0} \frac{2x^2 - 3x + 1}{x^2 - 2x + 4}$

9. Find the derivative of $3\tan x - 4\log x - 7x^2$ w.r.t. x.

10. Find the derivative of $e^{\sin x}$ w.r.t. x.

PART—B

8×5=40

Instructions : (1) Answer **all** questions.

(2) Each question carries **eight** marks.

11. *(a)* Show that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

(OR)

(b) Solve the following system of equations using Cramer's rule :

$$3x + y + 2z = 3$$
$$2x - 3y - z = -3$$
$$x + 2y + z = 4$$

12. *(a)* Show that $\frac{\sin\theta + \sin 3\theta + \sin 5\theta}{\cos\theta + \cos 3\theta + \cos 5\theta} = \tan 3\theta$.

(OR)

(b) Prove that $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$, then show that $xy + yz + zx = 1$.

13. *(a)* Solve $2\cos^2\theta - 3\cos\theta + 1 = 0$

(OR)

(b) In any ΔABC, show that $\sum a\sin(B-C) = 0$

14. *(a)* Find the equation of the circle passing through the points (0, 0), (2, 0) and (0, 3).

(OR)

(b) Find the centre, vertices, equations of axes, eccentricity, foci, length of latus-rectum of the hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$

15. *(a)* Find $\frac{dy}{dx}$, if $y = (\cos x)^{\sin x}$

(OR)

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

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) Question carries **ten** marks.

16. The time T of complete oscillation of simple pendulum with length l is given by $T = 2\pi\sqrt{\frac{l}{g}}$, where g is gravitational constant. Find the percentage error of T corresponding to an error 2% in the value of l.

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