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C20-M/CHOT–102

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BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

DME – FIRST YEAR 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 $f(x) = \frac{1}{x-2}$.

2. Resolve $\frac{5x-1}{(x-1)(x-2)}$ into partial fractions.

3. If $A = \begin{pmatrix} 3 & 9 & 0 \\ 1 & 8 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 0 & 2 \\ 7 & 1 & 4 \end{pmatrix}$, then find $A + B$.

4. Show that $\cos 100^\circ \cos 40^\circ + \sin 100^\circ \sin 40^\circ = \frac{1}{2}$.

5. Prove that $\frac{\cos 16^\circ + \sin 16^\circ}{\cos 16^\circ - \sin 16^\circ} = \tan 61^\circ$.

6. Find the additive and multiplicative inverses of the complex number $7 + 24i$.

7. Find the equation of the straight line passing through the point $(3, -4)$ and parallel to the line $x + 7y + 1 = 0$.

8. Evaluate $\lim_{x \to 0} \frac{\sin 3x}{x}$.

9. Find the derivative of $6x^2 + 12x - 13$ w.r.t. x.

10. Find $\frac{dy}{dx}$, if $y = \sin^{-1}\sqrt{x}$.

PART—B

8×5=40

Instructions : (1) Answer all questions.

(2) Each question carries eight marks.

11. *(a)* Find the inverse of the matrix $\begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix}$.

(OR)

(b) Solve the system of linear equations $2x - y + 3z = 9, x + y + z = 6$ and $x - y + z = 2$ using Cramer's rule.

12. *(a)* Prove that $\cos^2 A + \cos^2(60° + A) + \cos^2(60° - A) = \frac{3}{2}$.

(OR)

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

13. *(a)* Solve $\sqrt{3}\cos\theta - \sin\theta = 1$.

(OR)

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

14. *(a)* Find the equation of the circle with (–5, 1) and (3, –7) as the two end points of its diameter.

(OR)

(b) Find the equation of the conic whose focus is (1, –1), directrix is the line $x - y + 3 = 0$ and eccentricity is $\frac{1}{2}$.

15. *(a)* If $x = a\cos\theta$ and $y = b\sin\theta$, then find $\frac{d^2y}{dx^2}$.

(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) The question carries 10 marks.

16. Find the lengths of the tangent, normal, sub-tangent and sub-normal to the curve $x^2 + y^2 - 6x + 8y = 0$ at the point (7, –1).

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