6002

BOARD DIPLOMA EXAMINATION, (C-16)

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. Resolve $\dfrac{1}{(x-4)(x-9)}$ into partial fractions.

2. If $A = \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 \\ 2 & 0 \end{bmatrix}$, then find $3A - 2B$.

3. If $\begin{vmatrix} 1 & 2 \\ 3 & x \end{vmatrix}$, then find x.

4. Prove that $\tan(45° + A)\,\tan(45° - A) = 1$

5. Prove that $\dfrac{\sin 2\theta}{1 + \cos 2\theta} = \tan\theta$

6. Simplify $(3 - 4i)(4 + 3i)$ and write in the form $(a + bi)$.

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7. Find the perpendicular distance of the point $(3, -5)$ from the line $3x - 4y - 26 = 0$.

8. Find the equation of the line passing through the points $(1, 1)$ and $(2, 3)$.

9. Evaluate $\lim\limits_{x \to 0} \dfrac{3x^2 - 7x + 2}{5x^2 + 9x + 1}$

10. Find $\dfrac{dy}{dx}$, if $y = 3 \tan x + 4 \sin x + 5 \cos x$.

PART—B

10×5=50

Instructions : (1) Answer *any* **five** questions.

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

11. *(a)* Solve the system of equations $2x - y + 3z = 9$, $x + y + z = 6$ and $x - y + z = 2$ by Cramer's method.

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

12. *(a)* Prove that $\dfrac{\cos 7A + \cos 5A}{\sin 7A + \sin 5A} = \cot 6A$

(b) Prove that $\tan^{-1}\left(\dfrac{1}{7}\right) + \tan^{-1}\left(\dfrac{1}{13}\right) = \tan^{-1}\left(\dfrac{2}{9}\right)$

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

(b) Solve the ΔABC with $b = 1, c = \sqrt{3}, A = 30°$

14. *(a)* Find the centre and radius of the circle $x^2 + y^2 + 4x - 6y = 0$.

(b) Find the vertex, focus, latus rectum, axis and length of the latus rectum of the parabola $y^2 = 16x$.

15. *(a)* Find $\dfrac{dy}{dx}$, if $y = x\,(e^x + \log x)$

(b) Find $\dfrac{dy}{dx}$, if $y = \cos^{-1}(4x^3 - 3x)$

16. *(a)* Find $\dfrac{dy}{dx}$, if $x = a\cos\theta,\, y = a\sin\theta$

(b) Find $\dfrac{dy}{dx}$, if $y = \sqrt{\tan x + \sqrt{\tan x\sqrt{\tan x + \cdots + \infty}}}$

17. *(a)* Find the lengths of the tangent, normal, sub-tangent and sub-normal for the curve $y = x^3$ at $(1, 1)$.

(b) The radius of a spherical balloon is increasing at the rate of 3 cm^{-1}. Find the rate at which the volume is increasing when radius is 10 cm.

18. *(a)* Find the maximum and minimum values of $2x^3 - 9x^2 + 12x + 16$.

(b) If an error of 2% is made in measuring the side of a square, find approximate % error made in calculating its area.

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