6002

C16-A-AA-BM-CH-CHST-AEI-MNG-MET-TT-IT-PCT-C-CM-EC-CHPC-PET-EE-CHPP-M-CHOT-RAC–**102**

6002

BOARD DIPLOMA EXAMINATION, (C-16)

AUGUST/SEPTEMBER—2021

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

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

3. Evaluate : $\begin{vmatrix} 8 & 2 & 5 \\ 2 & -1 & 9 \\ 7 & 4 & 12 \end{vmatrix}$

4. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, then find $2A + 3B$.

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

6. Find the real and imaginary parts of $\frac{1}{1-2C}$.

7. Find the perpendicular distance of the point (2, 4) from the line $4x - 3y - 6 = 0$.

8. Find the equation of the line passing through the point (–2, 5) and have slope $\frac{-3}{4}$.

9. Evaluate : $\lim_{x \to 0} \frac{\sin 5x}{\sin 6x}$

10. Find $\frac{dy}{dx}$, if $y = e^x + x^2 - 2\sin x$.

PART—B

10×5=50

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

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

11. *(a)* Solve the system of equations $2x + y - z = 1$, $x + y - z = 0$ and $3x + 2y + 2z = 5$ by Cramer's method.

(b) If $A = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 5 \\ 0 & 6 \end{bmatrix}$, show that $(A + B)^T = A^T + B^T$.

12. *(a)* Prove that $\cos A + \cos(120° + A) + \cos(120° - A) = 0$

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

13. *(a)* Solve : $2\sin^2\theta - \sin\theta - 1 = 0$

(b) Solve the ΔABC with $a = 13$, $b = 14$, $c = 15$

14. *(a)* Find the centre and radius of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.

(b) Find the vertex, focus, latus rectum, axis and length of the latus rectum of the parabola $(y + 5)^2 = 4(x - 2)$.

15. *(a)* Find $\frac{dy}{dx}$, if $y = xe^x + \cos 2x$

(b) Find $\frac{dy}{dx}$, if $y = \sin^{-1}\left(3x - 4x^3\right)$

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

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

17. *(a)* Find the lengths of the tangent, normal, sub-tangent and sub-normal for the curve $y = x^3 - 2x^2 + 4$ at (2, 4).

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

18. *(a)* Find the maximum and minimum values of $2x^3 - 9x^2 + 12x + 15$.

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

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