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C20-C-CM–102

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BOARD DIPLOMA EXAMINATION, (C-20)

SEPTEMBER/OCTOBER—2021

DAE - 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 f if $f : A \to B$ defined by

$f = \{(-3, 1), (-1, 1), (1, 0), (3, 0)\}$

2. Resolve $\frac{x+1}{x^2+5x+6}$ into partial fractions.

3. If $A = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$, find AB.

4. Show that $\frac{\cos 37^\circ + \sin 37^\circ}{\cos 37^\circ - \sin 37^\circ} = \cot 8^\circ$

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

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6. Find the multiplicative inverse of the complex number $4 - 3i$.

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

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

9. Differentiate $\frac{1+e^x}{1-e^x}$

10. If $x = a\cos\theta$ and $y = a\sin\theta$, then find $\frac{dy}{dx}$.

PART—B

8×5=40

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

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

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

OR

(b) Solve the following equations by Cramer's Rule.

$x + 2y + 3z = 6$, $2x + 4y + z = 7$ and $3x + 2y + 3z = 8$

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

OR

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

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13. *(a)* Solve : $\sin x + \cos x = \sqrt{2}$

OR

(b) In any ΔABC, if $a\cos A = b\cos B$, prove that ΔABC is either isosceles or right angled.

14. *(a)* Find the equation of the parabola whose focus is the point (3, –4) and directrix is the line $x - y + 5 = 0$.

OR

(b) Find the centre, vertices, lengths of axes, length of latus-rectum, eccentricity, foci and the equations of the latus-recta and directrices of the ellipse $4x^2 + 9y^2 = 36$.

15. *(a)* If $x^y = e^{x-y}$, then prove that $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$ using logarithmic differentiation.

OR

(b) If $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \cdots \infty}}}$, then find $\frac{dy}{dx}$.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

16. Find the length of the tangent, normal, subtangent and subnormal to the curve $y = x^3 - 3x + 2$ at (0, 2).

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