C20-C-CM–102

7017

BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

DCE – 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. If $A = \{-2, -1, 0, 1, 2\}$ and $f : A \to B$ is a function such that $f(x) = x^2 - x - 1$, then find the range of *f*.

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

3. If $A = \begin{bmatrix} 2 & 3 & 1 \\ 6 & -1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$ and $A - B - X = 0$, then find *X*.

4. If $A - B = \dfrac{3\pi}{4}$, then prove that $(1 - \cot A)(1 - \cot B) = 2$.

5. Prove that $\dfrac{1 - \cos 2\theta}{\sin 2\theta} = \cot \theta$

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6. Find the modulus of the complex number $(3-4i)(2-3i)$.

7. Find the distance between the parallel lines $4x-3y-9=0$ and $4x-3y-5=0$

8. Evaluate $\lim\limits_{x\to 0}\dfrac{\tan 9x}{\tan 4x}$

9. Find the derivative of $\sqrt{x}\cdot\sec x\cdot\log x$ w.r.t. x.

10. Find the derivative of $\sqrt{\tan 2x}$ w.r.t. x.

PART—B

8×5=40

Instructions :   (1) Answer all questions.

                  (2) Each question carries eight marks.

11. *(a)* Show that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

(OR)

(b) Solve the following system of equations using matrix inversion method :

$x+y+z=6,\ x+y+z=2,\ 2x+y+z=1$

12. *(a)* If $\cos x + \cos y = \dfrac{3}{5}$ and $\cos x - \cos y = \dfrac{2}{7}$, then show that

$21\tan\left(\dfrac{x+y}{2}\right)+10\cot\left(\dfrac{x+y}{2}\right)=0$

(OR)

(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 $2\sin^2\theta - \sin\theta - 1 = 0$

(OR)

(b) In any $\triangle ABC$, show that $\cot\dfrac{A}{2} + \cot\dfrac{B}{2} + \cot\dfrac{C}{2} = \dfrac{s^2}{\triangle}$

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

(OR)

(b) Find the equation of the parabola whose focus is (1, –1) and directrix is $x - 2y + 1 = 0$

15. *(a)* If $x = a(\theta - \sin\theta)$ and $y = a(1 - \cos\theta)$, then find $\dfrac{dy}{dx}$ at $\dfrac{\pi}{2}$.

(OR)

(b) If $y = \tan^{-1}x$, then find $\left[1 + x^2\right]y_2 + 2xy_1 = 0$

PART—C

10×1=10

Instructions :   (1) Answer the following question.

                 (2) Its carries ten marks.

16. Find the length of tangent, normal, sub-tangent and sub-normal at the point (2, 4) on the curve $y = x^3 - 2x^2 + 4$ and also find the equations of tangent and normal.

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