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C14–A/AA/BM/CH/CHST/AEI/MNG/
MET/IT/TT/PCT–102

4002

BOARD DIPLOMA EXAMINATION, (C–14)
OCT/NOV—2016
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

$$\frac{5x \quad 6}{2 \quad x \quad x^2}$$

into partial fractions.

2. If

$$A \begin{matrix} 1 & 3 & 1 \\ 2 & 5 & 4 \\ 1 & 6 & 1 \end{matrix} ; B \begin{matrix} 2 & 0 & 2 \\ 2 & 1 & 5 \\ 0 & 2 & 4 \end{matrix}$$

find matrix X such that $2A \quad 3B \quad 2X \quad 0$.

3. Prove that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix} = 0$$

4. Prove that $\cos A + \cos(120 + A) + \cos(120 - A) = 0$.

5. Prove that

$$\frac{\sin 2A}{1 + \cos 2A} \cdot \frac{\cos A}{1 + \cos A} = \tan \frac{A}{2}$$

6. Find the modulus and amplitude of $\frac{9}{4 - 3i}$.

7. Find the distance between parallel lines $3x + 4y + 6 = 0$ and $3x + 4y + 2 = 0$.

8. Find the equation to the circle whose centre is (–1, 2) and radius is 3.

9. Evaluate :

$$\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$$

10. Differentiate $e^x . \sin x$ w.r.t. x.

PART—B

10×5=50

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

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

11. *(a)* Solve the following equations by Cramer's rule :

$2x + 3y + z = 1$; $x + 4y + 2z = 3$; $4x + y + 3z = 11$

(b) Show that

$$\begin{vmatrix} 1 + a & b & c \\ a & 1 + b & c \\ a & b & 1 + c \end{vmatrix} = 1 + a + b + c$$

12. *(a)* If $A \quad B \quad C \quad 180^\circ$, prove that $\tan\frac{A}{2}.\ \tan\frac{B}{2} \quad \tan\frac{B}{2}.\ \tan\frac{C}{2}.$ $\tan\frac{C}{2}.\ \tan\frac{A}{2} \quad 1..$

(b) Prove that

$$\sin^{\ 1}\frac{3}{5} \quad \sin^{\ 1}\frac{5}{13} \quad \cos^{\ 1}\frac{33}{65}$$

13. *(a)* Solve the equation $\sin 3 \quad \sin \quad \sin 7 \quad \sin 5$.

(b) In any ABC, prove that $a\sin(B \quad C) \quad 0.$

14. *(a)* Find the equation to the parabola whose focus is (2, –3) and directrix is $3x \quad 4y \quad 16 \quad 0.$

(b) Find the equation of the hyperbola whose foci are $(\ 2,0)$ and eccentricity $e \quad 4.$

15. *(a)* Find derivative of $\tan^{\ 1}\frac{2x}{1 \quad x^2}$ w.r.t. $\cos^{\ 1}\frac{1 \quad x^2}{1 \quad x^2}$.

(b) Find

$$\frac{dy}{dx} \text{ if } x^2 \quad y^2 \quad 3xy \quad 7.$$

16. *(a)* Find the lengths of the tangent, normal, subtangent and subnormal for the curve $y^2 \quad 4x$ at (1, 2).

(b) The radius of circle is increasing at the rate of 2 cm/sec. Find the rate of change of area when the radius is 24 cm.

17. *(a)* Find the maximum and minimum values of $2x^3 \quad 6x^2 \quad 18x \quad 21.$

(b) If the radius of a spherical ballon is increased by 0·2%, find the approximate percentage increase in its volume.

18. *(a)* If

$$x \quad t^4 \quad 5\ ;\ y \quad t^7 \quad 6, \text{ find } \frac{d^2y}{dx^2}.$$

(b) If

$$y \quad \sqrt{\sin x \quad \sqrt{\sin x \quad \sqrt{\sin x \ \ldots}}}$$

prove that $\frac{dy}{dx} \quad \frac{\cos x}{2y \quad 1}.$

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