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

4002

BOARD DIPLOMA EXAMINATION, (C–14)
MARCH/APRIL—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.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Split

$$\frac{2x}{x^2 \quad 2x \quad 1}$$

into partial fractions.

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2. If

$$A \quad \begin{matrix} 1 & 2 \\ 3 & 4 \end{matrix} , \quad B \quad \begin{matrix} 3 & 8 \\ 7 & 2 \end{matrix} \text{ and } 2X \quad A \quad B$$

then find X.

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3. Evaluate :

$$\begin{vmatrix} 11 & 12 & 13 \\ 14 & 15 & 16 \\ 17 & 18 & 19 \end{vmatrix}$$

4. If $\tan \ \sqrt{3}$ and $\tan \ 2 \ \sqrt{3}$, then show that $\ / 4$.

5. Prove that $\cos 10 \ \cos 50 \ \cos 70 \ \sqrt{3/8}$.

6. Express $\sqrt{3} \ i$ in the modulus amplitude form.

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

8. Find the equation of the tangent to the circle $x^2 \ y^2 \ 10x \ 4y \ 140 \ 0$ at $(\ 7, \ 7)$ on it.

9. Find

$$\underset{x \ 0}{\text{Lt}} \ \frac{5^x \ 3^x}{x}$$

10. Find the derivative of

$$\frac{\sin x}{1 \ \cos x}$$

w.r.t. x.

<center>PART—B</center> 10×5=50

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

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

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

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11. *(a)* Find the adjoint of

$$\begin{matrix} 2 & 7 & 3 \\ 3 & 9 & 4 \\ 1 & 5 & 3 \end{matrix}$$

(b) Solve the equations

$$2a + 3b + c = 1$$
$$a + 4b + 2c = 3$$
$$4a + b + 3c = 11$$

by Cramer's rule.

12. *(a)* Prove that

$$\frac{\cos 7A + \cos 5A + \cos 3A + \cos A}{\sin 7A + \sin 5A + \sin 3A + \sin A} = \cot 4A$$

(b) Solve :

$$\tan^{-1}\frac{x}{1-x} + \tan^{-1}\frac{x}{1+x} = \tan^{-1}2$$

13. *(a)* Solve the equation $\tan^3\theta = 3\tan\theta$.

(b) Solve the triangle ABC with $b = \sqrt{8}$, $c = \sqrt{12}$ and $B = 45°$.

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

(b) The cross section of a tunnel is a semi-ellipse, the road level being the major axis. The breadth of the road is 12 metres. A vehicle 4 metres high just touches the tunnel when one metre from a side. Find the greatest height of the tunnel.

15. *(a)* Find the derivative of $\log(\sin(\sqrt{\cos x}))$ with respect to x.

(b) If $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$, then prove that

$$\frac{dy}{dx} = \tan\theta$$

16. *(a)* Find the derivative of

$$\tan^{-1}\frac{2x}{1-x^2}$$

w.r.t. $\cos^{-1}\dfrac{1-x^2}{1+x^2}$.

(b) If

$$y = \tan^{-1} \frac{2x}{1-x^2}$$

then find $\dfrac{d^2y}{dx^2}$.

17. *(a)* Find the equation of tangent and normal to the curve $y = x^2 - 3x - 2$ at $(2, 0)$.

(b) The radius of a sphere is decreasing at the rate of $0\cdot2$ cm/sec. Find the rate at which its volume is decreasing when radius is 10 cm.

18. *(a)* Find the dimensions of rectangle of the maximum area having a perimeter of 48 ft.

(b) Find the approximately the value of $\sqrt{50}$.

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