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C–14–CHOT/M/RAC–**102**

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BOARD DIPLOMA EXAMINATION, (C–14)

APRIL/MAY—2015

DME—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. Resolve $\frac{3x}{(x \quad 2)(x \quad 1)}$ into partial fractions.

2. If $A \begin{matrix} 2 & 5 & 3 \\ 7 & 6 & 2 \end{matrix}$ and $B \begin{matrix} 1 & 2 & 7 \\ 3 & 5 & 4 \end{matrix}$, verify that $(A \quad B)^T \quad A^T \quad B^T$.

3. If is a cube root of unity, then prove that $\begin{vmatrix} 1 & & 2 \\ & 2 & 1 \\ 2 & 1 & \end{vmatrix}$ 0.

4. If $\tan A \quad \frac{5}{6}$ and $\tan B \quad \frac{1}{11}$, then show that $\tan(A \quad B) \quad 1$.

5. Prove that $\sin A \sin(60^\circ - A)\sin(60^\circ - A) = \frac{1}{4}\sin 3A$.

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

7. Find the distance between the parallel lines $3x - 2y - 9 = 0$ and $3x - 2y - 12 = 0$.

8. Find the equation of the circle whose centre is (1, 2) and radius is 5.

9. Evaluate $\lim_{n} \frac{1^2 - 2^2 - 3^2 - \cdots - n^2}{n^3}$.

10. If $x = at^2$, $y = 2$, then find $\frac{dy}{dx}$.

PART—B

10×5=50

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

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

11. *(a)* Find the adjoint of the matrix $\begin{matrix} 1 & 1 & 1 \\ 2 & 3 & 3 \\ 6 & 2 & 1 \end{matrix}$.

(b) Solve the equations $x - 2y - 3z = 6$, $2x - 4y - z = 7$ and $3x - 2y - 9z = 14$ by using Cramer's rule.

12. *(a)* If $A + B + C = 180^\circ$, then prove that

$$\sin 2A + \sin 2B + \sin 2C = 4\cos A \cos B \sin C$$

(b) If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$, then prove that $x + y + z = xyz$.

13. *(a)* Solve $\sqrt{3}\cos \quad \sin \quad 1$.

(b) Solve the triangle ABC with $a \quad 1$, $b \quad \sqrt{3}$, $c \quad 2$.

14. *(a)* Find the centre, vertices, eccentricity, foci, LLR and equations of the directrices of the ellipse $\frac{x^2}{25} \quad \frac{y^2}{9} \quad 1$.

(b) Find the equation of the rectangular hyperbola whose focus is the point (1, –5) and directrix is $x \quad y \quad 3 \quad 0$.

15. *(a)* If $y \quad \sqrt{\sin x \quad \sqrt{\sin x \quad \sqrt{\sin x \quad \cdots}}}$, then find $\frac{dy}{dx}$.

(b) If $y \quad ae^x \quad be^{\ x}$, then show that $\frac{d^2y}{dx^2} \quad y \quad 0$.

16. *(a)* Find $\frac{dy}{dx}$, if $x^3 \quad y^3 \quad 3axy \quad 0$.

(b) If $u \quad \log(x \quad y \quad z)$, then prove that $x\frac{u}{x} \quad y\frac{u}{y} \quad z\frac{u}{z} \quad 1$.

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

(b) A light is hung 8 m directly above a straight horizontal floor. A man 2 m tall is walking away from the lamp at the rate of 5·4 m/min. Find the rate at which his shadow is lengthening.

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

(b) The radius of a spherical balloon is increased by 1%. Find the approximate percentage increase in its surface area.

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