C09–TT–102/C09–RAC–**102**

3002

BOARD DIPLOMA EXAMINATION, (C–09)
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. Express $4x^2 \quad 4x \quad 5$ in the form of $A^2 \quad B^2$.

2. If $p \quad x \quad y, q \quad y \quad z, r \quad z \quad x$, find the value of $2p \quad 3q \quad 6r$ in terms of x, y, z.

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

4. Find the modulus of $\dfrac{1}{4 \quad 3i}$.

5. If $\tan A = \dfrac{1}{2}$ and $\tan B = \dfrac{1}{3}$, show that $A + B = 45°$.

6. Show that $\dfrac{\sin 2\theta}{1 + \cos 2\theta} = \cot \theta$.

7. Find the equation of the polar to the circle $x^2 + y^2 + 4x - 6y = 0$ with respect to $(-2, 5)$.

8. Find the perpendicular distance from the point $(1, 2)$ to the line $3x + 4y + 5 = 0$.

9. Differentiate $\dfrac{1 + \sin x}{1 - \sin x}$ w.r.t. x.

10. Find $\underset{n \to \infty}{\text{Lt}} \dfrac{n^2 + 3n + 4}{n^2 + 4}$.

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PART—B $\qquad\qquad$ 10×5=50

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

$\qquad\qquad\qquad$ (2) Each question carries **ten** marks.

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

11. *(a)* Show that

$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$$

$\quad$ *(b)* Solve the equations

$$6x + y + 3z = 5$$
$$x + 3y - 2z = 5$$
$$2x + y + 4z = 8$$

$\qquad$ using Cramer's rule.

12. *(a)* Solve $4\cos\theta = 3\sec\theta + 2\tan\theta$.

(b) In any $\triangle ABC$, prove that $c\cos^2\dfrac{A}{2} + a\cos^2\dfrac{C}{2} = s$.

13. *(a)* If $A + B + C = 180°$, prove that
$$\sin 2A + \sin 2B + \sin 2C = 4\sin A \sin B \sin C$$

(b) Show that
$$\tan^{-1}\frac{3}{4} + \tan^{-1}\frac{5}{12} = \tan^{-1}\frac{56}{33}$$

14. *(a)* Find the equation of hyperbola with centre at origin, y-axis as the conjugate axis and it is of length 8 passing through the point (6, 4).

(b) Find the distance between the points $(2, -1, 4)$ and $(-2, 1, 3)$.

15. *(a)* Find the vertex, focus, equation of directrix, equation of axis and length of latus rectum of the parabola represented by the equation $(y-3)^2 = 16(x-1)$.

(b) Find the equation of the ellipse which passes through the points $(1, -3)$ and $(-2, 2)$ with axes as coordinate axes.

16. *(a)* Differentiate x^x w.r.t. x.

(b) If $y = \sin(\log x)$, show that $x^2 y_2 + x y_1 + y = 0$.

17. *(a)* A wire of length 20 cm is bent to form a rectangle. Find the maximum area the rectangle encloses.

(b) If the percentage error in the side of an equilateral triangle is 3·5%, find the absolute error and percentage error in its area when the side is measured as $6/\sqrt{3}$ cm.

18. *(a)* Find the lengths of tangent, normal, subtangent and subnormal to the curve $x^2 - y^2 = 9$ at the point (5, 4).

(b) Each side of a square increases at the rate of 1·5 cm/sec. Find the rate at which the areas of the square increases when the side is 12 cm.

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