



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 $4x^2 - 4x - 5$ in the form of $A^2 - B^2$.

2. If $p = x + y$, $q = y + z$, $r = z + x$, find the value of $2p - 3q + 6r$ in terms of x, y, z .

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

4. Find the modulus of $\frac{1}{4 - 3i}$.

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5. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, show that $A + B = 45^\circ$.
6. Show that $\frac{\sin 2}{1 + \cos 2} = \cot$.
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 $\frac{1 + \sin x}{1 - \sin x}$ w.r.t. x .
10. Find $\lim_{n \rightarrow \infty} \frac{n^2 - 3n - 4}{n^2 + 4}$.

PART—B

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.

11. (a) Show that

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

(b) Solve the equations

$$6x + y + 3z = 5$$

$$x + 3y + 2z = 5$$

$$2x + y + 4z = 8$$

using Cramer's rule.

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12. (a) Solve $4 \cos^2 A = 3 \sec A + 2 \tan A$.
- (b) In any $\triangle ABC$, prove that $c \cos^2 \frac{A}{2} = a \cos^2 \frac{C}{2}$.
13. (a) If $A + B + C = 180^\circ$, 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 $x^2 y_2 + xy_1 - y = 0$.
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.
