



C09-A-102/C09-AA-102/C09-AEI-102/C09-BM-102/  
C09-C-102/C09-CM-102/C09-CH-102/C09-CHPC-102/  
C09-CHPP-102/C09-CHOT-102/C09-CHST-102/  
C09-EC-102/C09-EE-102/C09-IT-102/C09-M-102/  
C09-MET-102/C09-MNG-102/ C09-PET-102/  
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.

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.

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