



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/  
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**3002**

**BOARD DIPLOMA EXAMINATION, (C-09)  
MARCH/APRIL—2017  
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.

1. If  $x = \frac{1}{2}$ , find the values of  $x^2$  and  $\frac{1}{x^2}$ .

2. Express  $x^2 - 4x + 21$  in the form  $X^2 + A^2$ .

3. Resolve  $\frac{5x + 6}{(x - 2)(1 - x)}$  into partial fractions.

4. Show that  $\tan(45^\circ) \cdot \tan(45^\circ) = 1$ .

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5. Find the modulus and amplitude of  $\sqrt{3} - i$ .
6. Show that  $\frac{\cos 3}{\cos} - \frac{\sin 3}{\sin} = 1 - 2 \sin 2$ .
7. Find the equation of the straight line passing through the point (1, 2) and parallel to the line  $3x + 4y - 5 = 0$ .
8. Find the centre and radius of the circle  $x^2 + y^2 - 6x - 8y - 1 = 0$ .
9. Find  $\lim_{\theta \rightarrow 0} \frac{1 - \cos 2\theta}{2}$ .
10. If  $x = a \cos \theta$ ,  $y = b \sin \theta$ , 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 inverse of the matrix  $\begin{bmatrix} 1 & 2 & 2 \\ 1 & 3 & 0 \\ 0 & 2 & 1 \end{bmatrix}$ .

(b) Show that

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

12. (a) Show that

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

(b) Show that

$$\sin^{-1} \frac{3}{5} + \sin^{-1} \frac{5}{13} = \cos^{-1} \frac{33}{65}$$

13. (a) Solve  $\sqrt{3} \sin \theta = \cos \theta$  1.
- (b) In any  $\triangle ABC$  if  $A = 60^\circ$ , then show that  $\frac{b}{c} = \frac{c}{a} = \frac{a}{b} = 1$ .
14. (a) Find the vertex, focus, equation of the directrix and the length of latus rectum of the parabola  $y^2 - 4x - 4y - 16 = 0$ .
- (b) Find the equation of the ellipse whose focus is  $(0, 0)$ , eccentricity is  $\frac{1}{2}$  and directrix is  $x - y - 1 = 0$ .
15. (a) Find the equation of the hyperbola whose foci are  $(6, 4)$  and  $(-4, 4)$  and eccentricity is 2.
- (b) Show that the points  $(-2, 4, 1)$ ,  $(-1, 5, 5)$ ,  $(2, 2, 5)$  and  $(1, 1, 1)$  form a square.
16. (a) Find the equation of the tangent and normal to the curve  $y = x^3 - 2x^2 + 4$  at  $(2, 4)$ .
- (b) A circular plate of metal when heated such that its radius increases at the rate of  $0.02$  cm/sec. At what rate its area increases when the radius is  $20$  cm?
17. (a) If  $x^2 + y^2 - 6x - 3y - 1 = 0$ , find  $\frac{dy}{dx}$ .
- (b) Find the derivative of  $\tan^{-1} \frac{2x}{1-x^2}$  with respect to  $x$ .
18. (a) Find the maximum and minimum values of  $4x^3 - 9x^2 - 12x + 1$ .
- (b) If there is an error of  $1\%$  in measuring the side of a square plate, find the percentage error in its area.

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