



C09-CHPC-102/C09-EC-102/C09-PET-102

3028

BOARD DIPLOMA EXAMINATION, (C-09)

MARCH/APRIL—2014

DECE—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.  
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. If

$$u(x, y) = \frac{x^3}{x} - \frac{y^3}{y}$$

show that  $u(kx, ky) = k^2u(x, y)$ .

2. Express  $x^2 - 3x + 5$  in the form  $A^2 + B^2$ .

3. Resolve

$$\frac{2x + 1}{(x + 1)(x + 3)}$$

into partial fractions.

4. Show that

$$\tan(45^\circ) = \frac{\cos \theta}{\cos \theta} = \frac{\sin \theta}{\sin \theta}$$

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5. Show that

$$\frac{\cos 3A}{\sin 3A} = \frac{\cos A}{\sin A} \cot 2A$$

6. Find the modulus of

$$\frac{7 - 24i}{3 + 4i}$$

7. Find the equation of the straight line passing through the point (4, 3) and perpendicular to the line  $x - y - 1 = 0$ .

8. Find the equation of the circle whose centre is (2, 3) and radius is 4.

9. Find

$$\lim_{x \rightarrow 0} \frac{\sin 7x}{\tan 5x}$$

10. Find the derivative of  $\tan x \log x$  with respect to  $x$ .

**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) Solve

$$\begin{cases} 2x + y + z = 2 \\ x + 3y + z = 5 \\ 3x + 2y + 2z = 3 \end{cases}$$

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by matrix inversion method.

(b) Show that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a - b)(b - c)(c - a)$$

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12. (a) If  $A + B + C = 180^\circ$ , then show that  
$$\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$$

(b) Show that

$$\tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{13} = \cot^{-1} \frac{9}{2}$$

13. (a) Solve  $\sqrt{3} \cos \theta + \sin \theta = 1$ .

(b) In any triangle  $ABC$ , show that  $a \sin(B + C) = 0$ .

14. (a) Find the equation of the parabola whose focus is  $(5, 2)$  and vertex is  $(3, 2)$ .

(b) Find the equation of the ellipse whose focus is  $(1, 2)$ , directrix is  $x + y - 3 = 0$  and eccentricity is  $\frac{1}{2}$ .

15. (a) Find the centre, foci, vertices and equations of directrices of the hyperbola  $9x^2 - 16y^2 = 144$ .

(b) Show that the points  $(1, 1, 1)$ ,  $(-2, 4, 1)$  and  $(-1, 5, 5)$  form an isosceles right-angled triangle.

16. (a) If  $x^3 + y^3 = 3axy$ , then find  $\frac{dy}{dx}$ .

(b) If

$$y = x^{x^{x \dots \text{to } \infty}}$$

find  $\frac{dy}{dx}$ .

17. (a) Find the length of the tangent, normal, subtangent and subnormal to the curve  $y^2 = 4x$  at  $(1, 2)$ .

(b) A particle is moving along a straight line, according to the law  $s = 2t^3 - 3t^2 + 15t + 8$ . Find its velocity and acceleration at the end of 2 sec.

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18. (a) The sum of two numbers is 26. Find them, if their product is to be maximum.

(b) If the radius of a spherical balloon is increasing by 0.1 percent, find the approximate percentage increase in the volume.

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