



C09-CHPP-102/C09-EE-102

3034

BOARD DIPLOMA EXAMINATION, (C-09)

MARCH/APRIL—2014

DEEE—FIRST YEAR EXAMINATION

ENGINEERING MATHEMATICS—I

Time : 3 hours]

[Total Marks : 80

PART—A

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 $x = \frac{1}{x} + 5$, find $x^2 - \frac{1}{x^2}$.

2. Find the value of ${}^{10}P_5$.

3. Show that $\frac{1}{x-7} - \frac{1}{x+7} = \frac{2x}{x^2-49}$.

4. Show that $\frac{1 - \cos 2A}{\sin 2A} = \cot A$.

5. Show that $\frac{\cos 11^\circ - \sin 11^\circ}{\cos 11^\circ + \sin 11^\circ} = \cot 34^\circ$.

6. Find the multiplicative inverse of $4+5i$.

7. Find the equation of a straight line passing through $(2,-5)$ and perpendicular to $7x - 2y - 1 = 0$.

- * 8. Find the centre and radius of the circle $x^2 + y^2 - 3x - 4y = 0$
9. Find $\lim_{a \rightarrow 0} \frac{\tan a}{\sin b}$.
10. Find the derivative of $x^3 \log x$ w.r.t. 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. Solve the equations

$$\begin{cases} 3x + 2y + 2z = 5 \\ 2x + y + z = 1 \\ x + y + z = 0 \end{cases}$$

using matrix inverse method.

12. (a) Show that $\frac{\cos 3A}{\sin 3A} = \frac{\cos A}{\sin A} \cot 2A$

(b) Show that

$$\tan^{-1} \frac{2}{13} + \tan^{-1} \frac{5}{7} = \tan^{-1} \frac{79}{81}$$

13. (a) Solve $(2 \cos \theta - 1)(\cos \theta - 1) = 0$.

(b) In any $\triangle ABC$, show that

$$\frac{\cos A}{a} = \frac{a^2 + b^2 - c^2}{2abc}$$

* 14. (a) Find the equation of parabola with focus $(1, -1)$ and directrix $x + y + 2 = 0$.

(b) Find the centre, vertices, eccentricity, foci, equations of directrices and lengths of latus rectum of the ellipses represented by the equation $9x^2 + 4y^2 = 36$.

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- 15.** (a) Find the equation of hyperbola whose centre is $(-3, 4)$ and a focus is $(5, 4)$ with eccentricity $e = 2$.
- (b) Find the centroid of the triangle whose vertices are $(2, 2, -1)$, $(3, 4, 2)$ and $(7, 0, 6)$.
- 16.** (a) Differentiate $\tan^{-1}(\log x)$ with respect to $\log(\tan^{-1} x)$.
- (b) If $u = \tan^{-1} \frac{x^3 - y^3}{x - y}$, show that $x \frac{u}{x} - y \frac{u}{y} = \sin 2u$.
- 17.** (a) Find the lengths of tangent, normal, sub-tangent and sub-normal to the curve $xy = 9$ at the point $(3, 3)$.
- (b) Volume of a spherical balloon is increasing at a rate of 400 cubic cm/sec. Find the rate of increase of its radius and surface area when its radius is 40 cm.
- 18.** (a) The sum of two numbers is 36. Find them if their product is maximum.
- (b) If an error of 0.02 cm is made in measuring the radius 20 cm of a sphere, find the % error in its volume.
