



C14-EE/CHPP-102

4041

BOARD DIPLOMA EXAMINATION, (C-14)

OCT/NOV-2015

DEEE—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.

1. Resolve

$$\frac{1}{(x-5)(x-7)}$$

into partial fractions.

2. If

$$A = \begin{pmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{pmatrix} \text{ and } B = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{pmatrix}$$

verify that $(A+B)^T = A^T + B^T$.

3. Show that

$$\begin{vmatrix} b & c & a & a \\ b & c & a & b \\ c & c & a & b \end{vmatrix} = 4abc$$

4. Prove that $\tan(45^\circ - A)\tan(45^\circ + A) = 1$.
5. If $\sin x = \sin(60^\circ - x)$ then show that $\sin(60^\circ - x) = \frac{1}{4}\sin 3x$.
6. Find the modulus of $\frac{3 - 4i}{5 - 7i}$.
7. Find the equation of the circle with (2, 3) and (6, 9) as ends of a diameter.
8. Prove that
- $$\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta^2} = \frac{1}{2}$$
9. Find the equation of the straight line passing through the point (2, -5) and perpendicular to the line $7x - 2y - 1 = 0$.
10. Find $\frac{dy}{dx}$, if $y = \sin^2(2x - 3)$.

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 the equations $x + y + z = 6$, $x + 2y + 3z = 14$, $x + 4y + 9z = 36$ by using matrix inversion method.

(b) Show that

$$\begin{vmatrix} a & b & 2c & a & b \\ c & b & c & 2a & b \\ c & a & c & a & 2b \end{vmatrix} = 2(a - b - c)^3$$

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

(b) Prove that

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

13. (a) Solve : $\sin 6 \cos 2 = \sin 5 \cos \theta$.

(b) In a triangle ABC , prove that

$$\cot A \cot B \cot C = \frac{a^2 + b^2 + c^2}{4}$$

14. (a) Find the equation of the ellipse which passes through the points $(2, 2)$ and $(3, 1)$ with axes as coordinate axes.

(b) Find the coordinates of the centre, vertex, eccentricity, foci and LLR of the hyperbola $9x^2 - 16y^2 = 144$.

15. (a) If $X = t^4 - 5$, $y = t^7 - 6$ find $\frac{d^2y}{dx^2}$ at $t = \frac{1}{2}$.

(b) If $y = \tan^{-1}(\cos \sqrt{x})$ find $\frac{dy}{dx}$.

16. (a) If $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots}}}$ to ∞ , show that $\frac{dy}{dx} = \frac{1}{2y - 1}$.

(b) If $u = \sin^{-1} \frac{x^2 + y^2}{x - y}$ prove that $X \frac{u}{x} + Y \frac{u}{y} = \tan u$.

17. (a) Find the angle between the curves $y^2 = 4x$ and $x^2 = 4y$.

(b) The volume of the cube increases at the rate of 0.3 cubic cm/sec. Find the rate at which the surface area changes when the edge is 20 cm.

18. (a) Find the maximum and minimum values of the function

$$X^3 - 6X^2 + 9X - 1$$

(b) The circumference of a circle is measured as 28 cm and with an error of 0.01 cm. Find the approximate percentage error in the area of the circle.
