



C14-EE/CHPP-102

4041

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH/APRIL—2017

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

2. If $A = \begin{bmatrix} 2 & 3 & 1 \\ 6 & 1 & 5 \end{bmatrix}$ and $A + B = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 3 \end{bmatrix}$, find A and B .

3. Find $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1 & a & 1 \\ 1 & 1 & 1 & b \end{vmatrix}$.

4. Prove that $\frac{\cos 19^\circ \sin 19^\circ}{\cos 19^\circ \sin 19^\circ} = \tan 26^\circ$

5. Prove that $\frac{1 - \cos \theta}{1 + \cos \theta} = \frac{\sin \theta}{\sin \frac{\theta}{2}}$

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6. Find the modulus of $(3 - 4i)(4 - 3i)$.

7. Find the centre and radius of the circle

$$3x^2 + 3y^2 - 12x - 6y - 11 = 0$$

8. Find $\lim_{n \rightarrow \infty} \frac{1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2}{n^3}$.

9. Find the equation of the line passing through the point $(-3, -4)$ and parallel to the line $3x - y - 31 = 0$.

10. Find $\frac{dy}{dx}$, if $x = a(\sin \theta)$ and $y = a(1 - \cos \theta)$.

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 $2x + y + 3z = 9$, $x + y + z = 6$ and $x - y + z = 2$ by using Gauss-Jordan method.

(b) Show that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a - b)(b - c)(c - a)(a + b + c)$.

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12. (a) If $A + B + C = \pi$, prove that

$$\cos 2A + \cos 2B + \cos 2C + 1 = 4 \sin A \sin B \cos C$$

(b) If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{\pi}{2}$, then prove that

$$x^2 + y^2 + z^2 + 2xyz = 1$$

* **13.** (a) Solve the triangle ABC with $b = 1$, $c = \sqrt{3}$ and $A = 30^\circ$.

(b) In a triangle ABC , if $B = 3C$, then show that

$$\cos C = \sqrt{\frac{b-c}{4c}}$$

14. (a) Find the equation of the parabola whose vertex is $(4, 5)$ and directrix is $2x - 3y - 6 = 0$.

(b) Find the lengths of the semi-axes, centre, vertices, foci, LLR and equations of directrices of ellipse $3x^2 + 4y^2 = 36$.

15. (a) If $y = \log(x + \sqrt{x^2 + 1})$, show that $(1 - x^2)y_2 - xy_1 = 0$.

(b) Prove that $\frac{dy}{dx} = \frac{\log x}{(1 - \log x)^2}$, if $xy = e^{x-y}$.

16. (a) If $y = b \sin^3 \theta$, $x = a \cos^3 \theta$, find $\frac{d^2y}{dx^2}$.

(b) If $u = \log \frac{x^4 - y^4}{x - y}$, prove that $X \frac{u}{x} - Y \frac{u}{y} = 3$.

17. (a) Find the angle between the curves $Y^2 = 4X$ and $X + Y = 1$ at any point of intersection.

(b) Each side of a square increases at the rate of 1.5 cm/sec. Find the rate at which the area of the square increases when the side is 12 cm. Also find the rate at which its perimeter increases.

* **18.** (a) A right circular cylinder is inscribed in a sphere of radius R . Show that the volume is maximum when its height is $\frac{2R}{\sqrt{3}}$.

(b) If an error of 0.003 cm is made in measuring radius 20 cm of a sphere, find approximate percentage error in its volume.
