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C09–CHPC–102/C09–EC–**102**

# 3028

## BOARD DIPLOMA EXAMINATION, (C–09)

## OCT/NOV—2013

## DECE—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 $x \quad \frac{1}{x} \quad 1$, find the value of $x^3 \quad \frac{1}{x^3}$.

**2.** Rationalise the denominator of $\frac{\sqrt{19} \quad \sqrt{5}}{\sqrt{19} \quad \sqrt{5}}$.

**3.** Resolve $\frac{1}{(x \quad 9)(x \quad 7)}$ into partial fractions.

**4.** If $A \quad B \quad C \quad 90°$, prove that $\cot A \quad \cot B \quad \cot C \quad \cot A \cot B \cot C$.

**5.** Show that $\frac{\sin 2}{1 \quad \cos 2} \quad \tan$ .

**6.** Find the modulus of $\frac{3 \quad 4i}{4 \quad 3i}$.

**7.** Find the equation of the straight line passing through the point (5, –21) and perpendicular to the line $3x \quad 5y \quad 0$.

**8.** Find the equation of the point circle with centre (11, 3).

**9.** Evaluate $\lim_{x \quad 0} \frac{\tan 121x}{\tan 11x}$.

**10.** Differentiate $\sin x \log x$.

## PART—B

***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)* Using Laplace's expansion, evaluate

$$\begin{vmatrix} q & r & p \\ r & p & q \\ p & q & r \end{vmatrix}$$

*(b)* Find the adjoint of

$$\begin{matrix} 2 & 3 & 2 \\ 1 & 7 & 3 \\ 0 & 1 & 7 \end{matrix}$$

**12.** *(a)* If $A \quad B \quad C \quad 180^\circ$, show that

$$\sin 2A \quad \sin 2B \quad \sin 2C \quad 4 \sin A \cos B \cos C$$

*(b)* Prove that $\tan^{1} \frac{4}{9} \quad \tan^{1} \frac{3}{5} \quad \tan^{1} \frac{47}{33}$.

**13.** *(a)* Solve $2 \sin^2 \quad 1 \quad \cos$ .

*(b)* In any $ABC$, show that $\cot A \quad \frac{R(a^2 \quad b^2 \quad c^2)}{abc}$.

**14.** *(a)* Find the vertex, focus and directrix of the parabola $(y \quad 4)^2 \quad 12(x \quad 1)$.

*(b)* Find the equation of the ellipse which passes through the points (–2,1) and (–1, 3) with axes as coordinate axes.

**15.** *(a)* Find the equation of the rectangular hyperbola whose focus is (1,1) and directrix is $x \quad 3y \quad 1 \quad 0$.

*(b)* Find the perimeter and centroid of the triangle formed by the points (7,–4,7); (1,–6,10); (5,–1,1).

**16.** *(a)* Find $\frac{dy}{dx}$, if $x \quad 5( \quad \sin \ ), y \quad 5(1 \quad \cos \ )$.

*(b)* If $y \quad \sqrt{\cot x \quad \sqrt{\cot x \quad \sqrt{\cot x \ \cdots \text{to}}}}$, show that $\frac{dy}{dx} \quad \frac{\text{cosec}^2 x}{1 \quad 2y}$.

**17.** *(a)* For any curve, show that $\sqrt{\frac{\text{Subtangent}}{\text{Subnormal}}} = \frac{\text{Length of tangent}}{\text{Length of normal}}$.

*(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 perimeter increases.

**18.** *(a)* Find the dimensions of a rectangle of maximum area having a perimeter of 12 ft.

*(b)* The radius of a spherical balloon is increased by 2%. Find the approximate percentage increase in its surface area.

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