* 4002 *

**C–14–A/AA/BM/CH/CHST/AEI/FW/MNG/MET/IT/TT/PCT/PKG/PPT–102**

# 4002

## BOARD DIPLOMA EXAMINATION, (C–14)

## APRIL/MAY—2015

## FIRST YEAR (COMMON) 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.** Resolve $\frac{1}{(x \quad 8)(x \quad 11)}$ into partial fractions.

**2.** If $A \begin{matrix} 1 & 3 \\ 2 & 1 \end{matrix}$, then find $A^2 \quad 3A \quad 2I$, where $I$ is the unit matrix of order 2.

**3.** Using Laplace expansion, evaluate the determinant $\begin{vmatrix} q & r & p \\ r & p & q \\ p & q & r \end{vmatrix}$.

**4.** Show that $\frac{\cos 11^\circ \quad \sin 11^\circ}{\cos 11^\circ \quad \sin 11^\circ} \quad \tan 56^\circ$.

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

**6.** Find the mod-amplitude form of the complex number 1 $i\sqrt{3}$.

**7.** Find the intercepts made by the straight line $3x$ $2y$ 2 0 on the coordinate axes.

**8.** Find the equation of the circle having (–5, 1) and (3, –7) as end points of a diameter.

**9.** Evaluate $\underset{x \ 1}{\text{Lt}} \frac{x^2 \quad 5x \quad 6}{x^2 \quad x \quad 2}$.

**10.** Differentiate $\frac{a \quad b\cos x}{a \quad b\cos x}$ 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)* If $A$ $\begin{matrix} 3 & 3 & 4 \\ 2 & 3 & 4 \\ 0 & 1 & 1 \end{matrix}$ and $B$ $\begin{matrix} 3 & 1 & 2 \\ 2 & 0 & 5 \\ 1 & 2 & 0 \end{matrix}$, then find $AB$.

*(b)* Solve the system of equations $x$ $2y$ $3z$ 6, $2x$ $4y$ $z$ 7, $3x$ $2y$ $3z$ 8 using matrix inversion method.

**12.** *(a)* Show that $\frac{\cos 7A \quad \cos 5A}{\sin 7A \quad \sin 5A}$ $\cot 6A$.

*(b)* Show that $\tan^{1}\frac{2}{3}$ $\tan^{1}\frac{3}{4}$ $\tan^{1}\frac{17}{6}$.

**13.** *(a)* Solve, $\sqrt{3}\cos \quad \sin \quad \sqrt{2}$.

*(b)* In any triangle *ABC*, prove that $a^3.\sin(B \quad C) \quad 0$.

**14.** *(a)* Find the equation of parabola whose focus is (–4, 3) and directrix is $x \quad y \quad 2 \quad 0$.

*(b)* Find the centre, vertices, eccentricity, foci, directrices, length of latus rectum of the hyperbola $9x^2 \quad 4y^2 \quad 36$.

**15.** *(a)* Find the derivative of $\cos^{1}(4x^3 \quad 3x)$ with respect to $x$.

*(b)* Find $\frac{dy}{dx}$, if $x^3 \quad y^3 \quad 3axy$.

**16.** *(a)* If $y \quad \sqrt{\tan x \quad \sqrt{\tan x \quad \sqrt{\tan x \quad \sqrt{\cdots \text{ to}}}}}$, then show that $\frac{dy}{dx} \quad \frac{\sec^2 x}{2y \quad 1}$.

*(b)* Verify Euler's theorem for $f(x, y) \quad ax^2 \quad 2hxy \quad by^2$.

**17.** *(a)* Find the lengths of the tangent, normal, sub-tangent and sub-normal to the curve $x^2 \quad y^2 \quad 6x \quad 2y \quad 5 \quad 0$ at the point (2, 1).

*(b)* A stone is thrown upwards vertically whose movement is governed by $S \quad 80t \quad 16t^2$. Find its *(i)* initial velocity, *(ii)* time, when its velocity is zero and *(iii)* greatest height reached.

**18.** *(a)* Find the maximum and minimum values of the function $f(x) \quad 2x^3 \quad 9x^2 \quad 12x \quad 10$.

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

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