



**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

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**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  $\frac{1}{(x-8)(x-11)}$  into partial fractions.

2. If  $A = \begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix}$ , then find  $A^2 - 3A - 2I$ , 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  $\frac{\cos 11^\circ \sin 11^\circ}{\cos 11^\circ \sin 11^\circ} = \tan 56^\circ$ .

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5. Show that  $\frac{\sin 2}{1 - \cos 2} = \tan$  .
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  $\lim_{x \rightarrow 1} \frac{x^2 - 5x + 6}{x^2 - x - 2}$ .
10. Differentiate  $\frac{a + b \cos x}{a - b \cos x}$  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  $A = \begin{pmatrix} 3 & 3 & 4 \\ 2 & 3 & 4 \\ 0 & 1 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} 3 & 1 & 2 \\ 2 & 0 & 5 \\ 1 & 2 & 0 \end{pmatrix}$ , 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.

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

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

- \* **13.** (a) Solve,  $\sqrt{3} \cos \theta = \sin \theta = \sqrt{2}$ .
- (b) In any triangle  $ABC$ , prove that  $a^3 \cdot \sin(B - C) = 0$ .
- 14.** (a) Find the equation of parabola whose focus is  $(-4, 3)$  and directrix is  $x - y - 2 = 0$ .
- (b) Find the centre, vertices, eccentricity, foci, directrices, length of latus rectum of the hyperbola  $9x^2 - 4y^2 = 36$ .
- 15.** (a) Find the derivative of  $\cos^{-1}(4x^3 - 3x)$  with respect to  $x$ .
- (b) Find  $\frac{dy}{dx}$ , if  $x^3 + y^3 = 3axy$ .
- 16.** (a) If  $y = \sqrt{\tan x} \sqrt{\tan x} \sqrt{\tan x} \sqrt{\dots}$  to  $\infty$ , then show that  $\frac{dy}{dx} = \frac{\sec^2 x}{2y - 1}$ .
- (b) Verify Euler's theorem for  $f(x, y) = ax^2 + 2hxy + by^2$ .
- 17.** (a) Find the lengths of the tangent, normal, sub-tangent and sub-normal to the curve  $x^2 - y^2 - 6x + 2y - 5 = 0$  at the point  $(2, -1)$ .
- (b) A stone is thrown upwards vertically whose movement is governed by  $S = 80t - 16t^2$ . 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  $f(x) = 2x^3 - 9x^2 + 12x - 10$ .
- (b) The radius of a spherical balloon is increased by 2%. Find the approximate percentage increase in its surface area.

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