



\* 4034 \*

C14-EC-102/C14-CHPC-102/C14-PET-102

4034

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH/APRIL—2016

DECE—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.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

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

2. If  $A = \begin{pmatrix} \cos & \sin \\ \sin & \cos \end{pmatrix}$ , then show that  $A A^T = A^T A = I$ , where  $I$  is the unit matrix of order 2.

3. Using Laplace expansion, evaluate the determinant

$$\begin{vmatrix} 0 & q & r \\ q & 0 & p \\ r & p & 0 \end{vmatrix}$$

\*

4. Show that  $\frac{\cos 37^\circ \sin 37^\circ}{\cos 37^\circ \sin 37^\circ} = \cot 8^\circ$ .
5. Show that  $\tan \frac{\pi}{4} = \tan \frac{\pi}{4} + 2 \tan 2^\circ$ .
6. Find the real and imaginary parts of the complex number  $\frac{4 - 2i}{1 - 2i}$ .
7. Find the equation of the straight line making intercepts  $\frac{15}{3}$  and  $\frac{7}{5}$  with the  $x$ -axis and  $y$ -axis respectively.
8. Find the equation of the point circle with centre  $(2, -3)$ .
9. Evaluate :  $\lim_{n \rightarrow \infty} \frac{1^2 + 2^2 + 3^2 + \dots + n^2}{n^3}$ .
10. Differentiate between  $x^2 e^x \sec x$  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  $A = \begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & 1 & 0 \end{pmatrix}$ , compute  $A^2 - 5A + 6I$ , where  $I$  is the unit matrix of order 3.

(b) Solve the system of equation

$$\begin{cases} x + y + z = 3 \\ x + 2y + 3z = 4 \\ x + 4y + 9z = 6 \end{cases}$$

using Gauss-Jordan method.

\*

12. (a) In  $\triangle ABC$ , prove that

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

(b) Show that  $\sin^{-1} \frac{3}{5} + \sin^{-1} \frac{8}{17} = \cos^{-1} \frac{36}{85}$ .

13. (a) Solve :  $2 \cos^2 \theta = 3 \sin \theta$  .

(b) In  $\triangle ABC$ , if  $A = 60^\circ$ , show that

$$\frac{b}{c} + \frac{c}{a} + \frac{a}{b} = 1$$

14. (a) Find the vertex, focus, directrix, axis and length of latus rectum of the parabola  $7x^2 - 4y = 0$ .

(b) Find the equation of the ellipse whose axes are coordinate axes and passing through the points  $(1, -3)$  and  $(2, 2)$ .

15. (a) Find the derivative of  $e^{8x} \sec x$  with respect to  $x$ .

(b) Find  $\frac{dy}{dx}$ , if  $y = x^{\tan x}$ .

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

(b) If  $z = \log(x^2 + y^2)$ , show that  $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \frac{2}{x^2 + y^2}$ .

17. (a) Find the angle between the curves  $x^2 + y^2 = 1$  and  $xy = \sqrt{2}$  at  $(\sqrt{2}, 1)$ .

(b) A man of 2 m tall is approaching a lamp post at the rate of 0.5 m/sec. If the lamp is situated at a height of 8 m, then find the rate at which the length of the shadow of the man is decreasing.

- \* **18.** (a) Find the dimensions of a rectangle of maximum area having a perimeter of 36 ft.
- (b) Time of oscillation of a simple pendulum of variable length  $l$  is given by  $T = 2\sqrt{\frac{l}{g}}$ . If the length is increased by 2%, find the approximate increase in its time of oscillation, where  $g$  is a constant.

\*\*\*