



C14-M/CHOT/RAC-102

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BOARD DIPLOMA EXAMINATION, (C-14)  
OCT/NOV—2016  
DME—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

$$\frac{(x-4)}{(x-2)(x-7)}$$

into partial fractions.

2. If

$$A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 3 & 4 \end{pmatrix} \text{ and } B = \begin{pmatrix} 0 & 2 & 1 \\ 4 & 3 & 2 \end{pmatrix}$$

then find the value of  $2A - 3B$ .

/4050

1

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3. Find the <sup>\*</sup>determinant of the matrix

$$\begin{vmatrix} 1 & 1 & 2 \\ 3 & 0 & 4 \\ 4 & 2 & 5 \end{vmatrix}$$

4. Prove that

$$\sin^2 75^\circ + \cos^2 45^\circ = \frac{\sqrt{3}}{4}$$

5. Prove that

$$\frac{\sin 2\theta}{1 - \cos 2\theta} = \cot \theta$$

6. Find the multiplicative inverse of  $7 - 24i$ .

7. Find the angle between the lines  $2x - y - 3 = 0$  and  $x - y - 2 = 0$ .

8. Find the equation of the point circle with centre  $(7, -9)$ .

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{\sin^2 x}$$

10. Find the derivative of  $y = x^3 \tan x$  with respect to  $x$ .

### PART—B

10×5=50

<sup>\*</sup>**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) Show that

$$\begin{vmatrix} 1 & a & 1 & 1 \\ 1 & 1 & b & 1 \\ 1 & 1 & 1 & c \end{vmatrix} = abc + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$$

/4050

2

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(b) Find the adjoint of the matrix

$$\begin{bmatrix} 2 & 3 & 1 \\ 4 & 0 & 3 \\ 3 & 1 & 7 \end{bmatrix}$$

12. (a) If any triangle  $ABC$ , prove that

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

(b) Prove that

$$\tan^{-1} \frac{2}{7} + \tan^{-1} \frac{1}{5} = \tan^{-1} \frac{17}{33}$$

13. (a) Solve  $2 \sin^2 x - 4 = 5 \cos x$ .

(b) If any triangle  $ABC$ , then prove that  $2bc \cos A = a^2 - b^2 - c^2$ .

14. (a) Find the vertex, focus, directrix and length of latus rectum (LLR) of the parabola  $7x^2 - 16y = 0$ .

(b) Find the centre, foci, vertices, eccentricity and length of latus rectum (LLR) of the ellipse  $9x^2 + 25y^2 = 225$ .

15. (a) Find the derivative of

$$\frac{\sin x}{1 + \cos x}$$

with respect to  $x$ .

(b) Find

$$\frac{dy}{dx}$$

if  $y = e^{8x} \sec x$ .

16. (a) Find the derivative of a function

$$y = \sqrt{x \sqrt{x \sqrt{x \dots}}}$$

(b) Find

$$\frac{d^2y}{dx^2}$$

if  $y = \tan^{-1} x$ .

17. (a) Find the equations of tangent and normal to the curve  $3y = x^2 - 6x + 17$  at the point (4, 3).
- (b) The law of the motion of a particle along a line is  $s = t^3 - 9t^2 + 24t - 8$ . At what instants, the particle comes to rest?
18. (a) Show that the area of a rectangle of given fixed perimeter is maximum when the rectangle is a square.
- (b) If there is an error of 1% in measuring the side of a square plate, then find the percentage error in its area.

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