



C16-M/CHOT/RAC-102

6052

BOARD DIPLOMA EXAMINATION, (C-16)

MARCH/APRIL—2018

DME—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.

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

2. If  $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ ,  $B = \begin{pmatrix} 3 & 8 \\ 7 & 2 \end{pmatrix}$  and  $2x = A + B$ , then find  $x$ .

3. Find  $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1 & a \\ 1 & 1 & 1 & b \end{vmatrix}$ .

4. Prove that  $\frac{\cos 37^\circ \sin 37^\circ}{\cos 37^\circ \sin 37^\circ} = \cot 8^\circ$ .

5. Prove that  $\frac{1 - \cos \theta}{1 + \cos \theta} = \frac{\sin \theta}{\sin \theta} = \tan^2 \frac{\theta}{2}$ .

6. Find the modulus and amplitude of  $1 - i\sqrt{3}$ .

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

- \* 8. Find the distance between parallel lines  $3x + 4y + 3 = 0$  and  $6x + 8y + 1 = 0$ .
9. Find  $\lim_{x \rightarrow 0} \frac{\sqrt{1 - 3x} - 1}{x}$ .
10. Find  $\frac{dy}{dx}$  if  $x = a(\sin \theta)$  and  $y = a(1 - \cos \theta)$ .

**PART—B**

10×5=50

**Instructions :** (1) Answer *any five* questions.

(2) Each question carries **ten** marks.

11. (a) Solve the equations  $2x + y + 3z = 9$ ,  $x + y + z = 6$  and  $x + y + z = 2$  by using Cramer's method.

(b) Show that  $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$ .

12. (a) Show that  $\sin^2 A + \sin^2(60^\circ - A) + \sin^2(60^\circ + A) = \frac{3}{2}$ .

(b) If  $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$ , then prove that  $xy + yz + zx = 1$ .

13. (a) Solve the equation  $\tan^3 x = 3 \tan x$ .

(b) Solve the triangle ABC with  $a = 2$ ,  $b = 2\sqrt{3}$  and  $c = 4$ .

14. (a) Find the equation of the circle passing through the points (0, 0), (1, 0) and (0, 1).

(b) Find the lengths of the semi-axes, centre, vertices, foci, LLR and equations of directrices of ellipse  $\frac{x^2}{25} + \frac{y^2}{16} = 1$ .

15. (a) If  $y = \log(x + \sqrt{x^2 + 1})$ , then find  $\frac{dy}{dx}$ .

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

- \* 16. (a) If  $y = a \cos(\log x) + b \sin(\log x)$ , then show that

$$x^2 y_2 - x y_1 - y = 0$$

- (b) If  $u = \log \frac{x^4 - y^4}{x - y}$ , then prove that  $x \frac{u}{x} - y \frac{u}{y} = 3$ .

17. (a) Find the angle between the curves  $y^2 = x$  and  $x^2 = y$  at point of intersection (1, 1).

- (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) Show that the maximum rectangle that can be inscribed in a circle is a square.

- (b) If an error of 0.02 cm is made in measuring the radius 10 cm of a sphere, find the approximate percentage error in the surface area of the sphere.

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