



C16-A/AA/BM/CH/CHST/AEI/MNG/  
MET/TT/IT/PCT—102

6002

BOARD DIPLOMA EXAMINATION, (C-16)  
SEPTEMBER/OCTOBER - 2020  
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.

1. Resolve

$$\frac{1}{(x-1)(x-2)}$$

into partial fractions.

2. If

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

find  $4A - 3B$ .

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3. Using Laplace expansion, evaluate the determinant

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

4. Show that

$$\frac{\cos 12^\circ \sin 12^\circ}{\cos 12^\circ \sin 12^\circ} \tan 57^\circ$$

5. Show that

$$\frac{\sin 2A}{1 - \cos 2A} \tan A$$

6. Find the multiplicative inverse of  $7+4i$ .

7. Find the equation of the line passing through the points  $(1, 2)$  and  $(-3, 5)$ .

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

9. Evaluate

$$\lim_{x \rightarrow 5} \frac{x^3 - 125}{x - 5}$$

10. Differentiate  $3 \tan x - 4 \log x - 2x^2$  w.r.t.  $x$ .

### PART—B

10×5=50

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

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

11. (a) Find the adjoint of the matrix

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

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[ Contd...

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(b) Solve the equations

$$\begin{aligned}x + 2y + 3z &= 14 \\3x + y + 2z &= 11 \\2x + 3y + z &= 11\end{aligned}$$

by Cramer's method.

12. (a) Prove that

$$\cos 10^\circ \cos 50^\circ \cos 70^\circ = \frac{\sqrt{3}}{8}$$

(b) Show that

$$\tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{13} + \tan^{-1} \frac{2}{9}$$

13. (a) Solve  $\sin 5^\circ \sin 3^\circ$ .

(b) In any triangle ABC, prove that  $a \sin(B - C) = 0$ .

14. (a) Find the equation of the circle passing through the points (0, 0), (2, 0) and (0, 3).

(b) Find the equation of rectangular hyperbola with focus (3, 4) and directrix is  $4x - 3y - 1 = 0$ .

15. (a) Differentiate  $\sin x^8$  w.r.t.  $x$ .

(b) Differentiate  $X^x$  w.r.t.  $x$ .

16. (a) Find

$$\frac{dy}{dx}, \text{ if } x = at^2, y = 2at$$

(b) Differentiate  $\cos^{-1}(4x^3 - 3x)$  w.r.t.  $\sin^{-1} x$ .

- \* 17. (a) Find the lengths of the tangent, normal, sub-tangent and sub-normal to the curve  $y = x^3$  at the point (1, 1).
- (b) A particle is moving along a line whose movement is governed by  $S = t^2 - 6t + 8$  ( $t$  in sec). Find the velocity and acceleration at  $t = 2$  sec.
18. (a) The sum of two numbers is 24. Find them so that their product is a maximum.
- (b) An error of 0.05 cm is committed in measuring a length of 10 cm. Find the absolute error, relative error and percentage error.

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