



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

6002

BOARD DIPLOMA EXAMINATION, (C-16)
OCT/NOV—2017
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

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

into partial fractions.

2. If

$$A = \begin{pmatrix} 1 & 1 \\ 2 & 1 \end{pmatrix} \text{ and } B = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$$

show that $(A+B)^T = A^T + B^T$.

3. Using Laplace expansion, evaluate

$$\begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$$

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4. Show that

$$\frac{\cos 16^\circ \sin 16^\circ}{\cos 16^\circ \sin 16^\circ} \tan 61^\circ$$

5. Prove that

$$\tan \frac{A}{4} \tan \frac{A}{4} = 2 \sec 2A$$

6. Find the additive and multiplicative inverse of

$$\frac{7}{2 - i\sqrt{3}}$$

7. Find the equation of the straight line passing through the points (1, 2) and (3, 4).

8. Find the perpendicular distance of the point (2, 3) from the line $2x - y - 3 = 0$.

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{x}{\sqrt{2-x} - \sqrt{2+x}}$$

10. Differentiate $e^{2x} (x^2 - 1)$ w.r.t. x .

PART—B

10×5=50

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

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

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11. (a) Show that

$$\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & 1 & \omega^2 \\ \omega^2 & \omega & 1 \end{vmatrix} = 0$$

where ω is cube root of unity.

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(b) Using Cramer's rule. Solve the equations

$$\begin{cases} x + 2y + 3z = 6 \\ 3x + 2y + 4z = 5 \\ x + y + z = 1 \end{cases}$$

12. (a) If $\cos x = \cos y = \frac{5}{7}$ and $\cos x = \cos y = \frac{5}{6}$, then show that

$$6 \tan \frac{x-y}{2} = 7 \cot \frac{x-y}{2} = 0$$

(b) Show that

$$\tan^{-1} \frac{3}{4} + \tan^{-1} \frac{5}{12} = \cot^{-1} \frac{63}{16}$$

13. (a) Solve $\sin 9^\circ + \sin 6^\circ + \sin \theta = 0$

(b) In $\triangle ABC$, prove that $(c-a)\cos B = 2s$

14. (a) Find the equation of the circle having $\frac{1}{2}, \frac{5}{2}$ and $\frac{3}{2}, \frac{1}{2}$ as the extremities of the diameter.

(b) Find the length of major axis and minor axis, length of latus rectum, centre, eccentricity, foci and equations of directrices of the ellipse $25x^2 + 16y^2 = 400$.

15. (a) Differentiate $\cot^{-1} \frac{1 + \cos x}{\sin x}$ w.r.t. x .

(b) If $y = \sqrt{\operatorname{cosec} x + \sqrt{\operatorname{cosec} x + \sqrt{\operatorname{cosec} x + \dots}}}$, find $\frac{dy}{dx}$.

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16. (a) If $y = \cot^{-1} x$, show that $(1-x^2)y_2 - 2xy_1 = 0$

(b) If $u = \log(x + y + z)$, find $\frac{u}{x} + \frac{u}{y} + \frac{u}{z}$.

- * 17. (a) Find the angle between the curves $x^2 = 4y$ and $y^2 = 4x$ at the point (4, 4).
- (b) A wire of length 40 cm is cut into two parts which are bent in the form of a square and circle. Find the least value of the sum of the areas so formed.
18. (a) A light is hung 4 m directly above a straight horizontal floor. A man of 1.5 m tall is walking away from the lamp at the rate of 5 m/minute. Find the rate at which his shadow is lengthening.
- (b) A circular plate expands when heated from a radius 5 cm to 5.03 cm. Find the approximate increase in its area. Also find the relative increase and percentage increase in it.
