



C09-A-102/C09-AA-102/C09-AEI-102/C09-BM-102/
C09-CH-102/C09-CHST-102/C09-FW-102/
C09-IT-102/C09-MET-102/C09-MNG-102/
C09-PKG-102/C09-TT-**102**

3002

**BOARD DIPLOMA EXAMINATION, (C-09)
OCT/NOV—2013
FIRST YEAR (COMMON) EXAMINATION**

ENGINEERING MATHEMATICS—I

Time : 3 hours]

[Total Marks : 80

PART—A

- 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. Solve the equation $5x^2 - 11x - 12 = 0$.

2. Simplify $(a - b - c)(b - a - c)(c - a - b)(b - c - a)$ by removing the brackets.

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

4. Show that $\frac{\tan 2A}{1 - \sec 2A} = \tan A$

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5. Express $\frac{3-i}{3+i}$ in the form of $a+ib$.
6. Prove that $\tan 8A \tan 6A \tan 2A = \tan 8A \tan 6A \tan 2A$.
7. Find the equation of the straight line passing through the points (0,1) and (3, -4).
8. Find the centre and radius of the circle $x^2 + y^2 - 7x - 8y - 1 = 0$.
9. Differentiate $\tan^{-1} \frac{2x}{1-x^2}$ with respect to x .
10. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 47x}{\tan 11x}$.

PART—B

- 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.

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11. (a) Using Laplace expansion, evaluate

$$\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$$

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(b) Find the inverse of the matrix

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

12. (a) Show that $\frac{\sin 3A \sin 7A \sin A \sin 11A}{\sin 3A \cos 7A \sin A \cos 11A} = \tan 8A$.

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

13. (a) Solve $\cos 5\theta = \cos \theta \cos 3\theta$.

(b) In any $\triangle ABC$, prove that

$$\frac{b+c}{a} = \frac{\sin \frac{B+C}{2}}{\cos \frac{A}{2}}$$

14. (a) Find the equation of the parabola whose axis is parallel to X-axis and passing through the points (2,0), (3,4) and (0,2).

(b) Find the equation of the ellipse whose foci are (0,4) and (0,-4) with eccentricity $e = \frac{1}{3}$.

15. (a) Find the equation of the conic whose focus at (-1, 1) and directrix $x - 4y + 3 = 0$ with eccentricity 2.

(b) Find the equation of the plane passing through the point (4,0,1) and parallel to the plane $4x - 3y + 12z - 6 = 0$.

16. (a) Differentiate $(\sin x)^{\cos x}$ with respect to x .

(b) If $x = t^4 - 5$, $y = t^7 - 6$, find $\frac{d^2y}{dx^2}$ at $t = \frac{1}{2}$.

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17. (a) Show that the square has the smallest perimeter of all the rectangles of given area.
- (b) The side of an equilateral triangle increases by 3%. Find the rate at which its area increases when the side is $20/\sqrt{3}$ cm. Also find the percentage increase in its area approximately.
18. (a) Find the lengths of tangent, normal, subtangent and subnormal to the curve $3y = x^2 - 6x + 17$ at (4,3).
- (b) A stone is thrown upwards vertically whose movement is governed by $s = 80t - 16t^2$. Find its—
- initial velocity;
 - time when velocity is zero;
 - greatest height reached.
