C09–A–102/C09–AA–102/C09–AEI–102/C09–BM–102/
C09–C–102/C09–CM–102/C09–CH–102/C09–CHPC–102/
C09–CHPP–102/C09–CHOT–102/C09–CHST–102/
C09–EC–102/C09–EE–102/C09–IT–102/C09–M–102/
C09–MET–102/C09–MNG–102/C09–PET–102/

C09–TT–102/C09–RAC–**102**

3002

BOARD DIPLOMA EXAMINATION, (C–09)
OCT/NOV—2016
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) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Simplify $m - [n - [2n - (3n - (5n - m))]] - 3n$ by removing the brackets.

2. Find the quotient and remainder when $2x - 3$ is divided by $5x - 7$.

3. Resolve

$$\frac{7x - 11}{(x - 1)(x - 2)}$$

into partial fractions.

4. Express $\sqrt{3} - i$ in the modulus amplitude form.

5. Prove that $\cos\theta \cdot \cos(60 - \theta)\cos(60 + \theta) = \frac{1}{4}\cos 3\theta$.

6. If $A + B + C = 180º$, show that

$$\tan\frac{A}{2}\tan\frac{B}{2} + \tan\frac{B}{2}\tan\frac{C}{2} + \tan\frac{C}{2}\tan\frac{A}{2} = 1$$

7. Find the perpendicular distance from the point (5, –7) to the line $3x + 5y + 7 = 0$.

8. Find the centre and radius of the circle

$$25x^2 + 25y^2 - 20x + 30y - 12$$

9. Find the derivative of $x^3\log x$ w.r.t. x.

10. Find

$$\underset{\theta \to 0}{\text{Lt}}\ \frac{\tan a\theta}{\sin b\theta}$$

<div align="center">

PART—B   10×5=50

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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)* If

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & 1 & 0 \end{bmatrix}$$

Find A^2.

(b) Solve the equations

$$x + 2y + 3z = 6$$
$$2x + 4y + z = 7$$
$$3x + 2y + 9z = 14$$

using Cramer's rule.

/3002   2   [*Contd...*

12. *(a)* Solve $2\cos^2\theta - 3\cos\theta + 1 = 0$.

(b) In any $\triangle ABC$, show that $\sum \dfrac{\sin A}{a} = \dfrac{3}{2R}$.

13. *(a)* Show that

$$\frac{\sin 17A - \sin 7A}{\cos 17A + \cos 7A} = \tan 12A$$

(b) Show that

$$\tan^{-1}\frac{2}{3} + \cot^{-1}\frac{4}{3} = \tan^{-1}\frac{17}{6}$$

14. *(a)* Find the equation of parabola whose axis is parallel to X-axis and passing through the points $(-2, 1)$, $(1, 2)$ and $(-1, 3)$.

(b) Find the centre, vertices, eccentricity, foci, equations of directrices and lengths of latus rectum of the ellipses represented by the equation $4x^2 + 9y^2 = 36$.

15. *(a)* Find the equation to the rectangular hyperbola with focus $(3, 4)$ and directrix $4x - 3y + 1 = 0$.

(b) Find the centroid of the tetrahedron whose vertices are $(-9, 2, 4), (-3, 1, 2), (4, 6, 7), (8, 2, 0)$.

16. *(a)* If

$$y = \frac{(x-a)(x-b)}{(x+a)(x+b)}$$

Find $\dfrac{dy}{dx}$.

(b) If

$$u = \log(x + y + z)$$

Show that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + z\dfrac{\partial u}{\partial z} = 1$.

17. *(a)* Find the volume of the largest right circular cone that can be inscribed in a sphere of radius R.

(b) Time of oscillation of a simple pendulum of variable length l is given by $T = 2\pi\sqrt{\dfrac{l}{g}}$. If the length is increased by 4%, find the approximate percentage increase in its time of oscillation where g is constant.

18. *(a)* Find the angle between the curves $y^2 = 4x$ and $x \cdot y = 1$ at any point of intersection.

(b) A circular plate of metal expands by heat so that its radius increases at the rate of $0 \cdot 01$cm/sec. At what rate is the surface increasing when the radius is 2 cm?

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