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

6002

BOARD DIPLOMA EXAMINATION, (C–16)
MARCH/APRIL—2018
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) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Resolve

$$\frac{3x}{(x-2)(x-1)}$$

into partial fractions.

2. If $A = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$, then show that $A^2 - 4A - 7I = O$, where I is the identity matrix and O is the null matrix.

3. If $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & 6 & x \end{pmatrix}$ and $\det A = 45$, then find the value of x.

4. If $A + B = 45°$, then show that $(1 + \tan A)(1 + \tan B) = 2$.

5. If $x \quad \frac{1}{x} \quad 2\cos$, then show that $x^2 \quad \frac{1}{x^2} \quad 2\cos 2$.

6. Express the complex number $\sqrt{3} \quad i$ in modulus-amplitude form.

7. Find the distance from the origin to the straight line $3x \quad 4y \quad 5 \quad 0$.

8. Find the equation of the straight line passing through the point (3, 4) and parallel to the line $3x \quad y \quad 31 \quad 0$.

9. Evaluate :

$$\lim_{x \quad 0} \frac{3x \quad \sin 3x}{x}$$

10. Find the derivative of $\log[\log(\log x)]$ with respect to x.

PART—B 10×5=50

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 $A \quad \begin{matrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{matrix}$, then find $A^{\quad 1}$.

(b) Solve the equations $3x \quad y \quad z \quad 3$, $2x \quad 2y \quad 5z \quad 1$ and $x \quad 3y \quad 4z \quad 2$ by Cramer's rule.

12. *(a)* Prove that

$$\frac{\sin 8A \quad \sin 6A}{\cos 8A \quad \cos 6A} \quad \tan 7A$$

(b) If $\tan^{\quad 1} x \quad \tan^{\quad 1} y \quad \tan^{\quad 1} z \quad /2$, then prove that $xy \quad yz \quad zx \quad 1$.

13. *(a)* Solve cos $\sqrt{3}\sin$ 1

(b) In a ABC, if A 60°, then prove that

$$\frac{c}{a\ b}\ \frac{b}{c\ a}\ 1$$

14. *(a)* Find the centre and radius of the circle $x^2\ y^2\ 6x\ 4y\ 12\ 0$.

(b) Find the equation of the parabola whose focus is the point (3, 4) and directrix is the line $x\ y\ 5\ 0$.

15. *(a)* Differentiate $e^{\tan^{1}x}$ with respect to $\tan^{1}x$.

(b) If $y\ \sqrt{\log x\ \sqrt{\log x\ \sqrt{\log x\ \ldots}}}$, then find $\frac{dy}{dx}$.

16. *(a)* If $x\ a(\cos t\ t\sin t)$ and $y\ a(\sin t\ t\cos t)$, then find $\frac{d^2y}{dx^2}$.

(b) If $u\ \tan^{1}\frac{x^3\ y^3}{x\ y}$, then prove that

$$x\frac{u}{x}\ y\frac{u}{y}\ \sin 2u$$

17. *(a)* Find the lengths of the tangent, normal, sub-tangent and subnormal to the curve $y\ x^3\ 2x^2\ 4$ at the point (2, 4).

(b) A circular metal plate expands by heat so that its radius is increasing at the rate 0·02 cm/sec. At what rate its area increasing when the radius is 20 cm?

18. *(a)* A right circular cylinder is inscribed in a sphere of radius R. Show that the volume of the cylinder is maximum when its height is $\frac{2R}{\sqrt{3}}$.

(b) If the radius of a spherical balloon is increased by 0·1%, find the approximate percentage increase in its volume.

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