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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/
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3002**BOARD DIPLOMA EXAMINATION, (C-09)****OCT/NOV—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. If $A = 2a + 3b + 5c$, $B = 5a + 3b + 7c$ and $C = a + 2b + c$, then find $2A + 3B + 5C$.

2. If $x = \frac{1}{3}$, then find the value of $x^3 + \frac{1}{x^3}$.

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3. Resolve $\frac{x^4}{x^2 - x - 3}$ into partial fractions.
4. Prove that $\tan 8A = \tan 5A + \tan 3A + \tan 8A \tan 5A \tan 3A$.
5. Prove that $\frac{\sin 2}{1 - \cos 2} = \cot$.
6. Find the complex conjugate of $2 - 5i + 4 - 6i$.
7. Find the distance of the point $(2, 3)$ from the line $2x + y - 3 = 0$.
8. Find the equation of the circle having $(3, 4)$ and $(7, -2)$ as the extremities of the diameter.
9. Find $\lim_{x \rightarrow 0} \frac{\sin 5x}{\sin 6x}$.
10. Find $\frac{dy}{dx}$, if $y = x^x$.

PART—B

10×5=50

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

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

(3) The answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. (a) If $A = \begin{pmatrix} 1 & 2 & 1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{pmatrix}$, verify that $A \cdot B^T = B^T \cdot A^T$.
- (b) Solve the following equations by using Cramer's rule
 $x + 2y + z = 1$, $3x + y + 2z = 5$ and $x + y + 3z = 0$.
12. (a) In $\triangle ABC$, prove that $\tan A + \tan B + \tan C = \tan A \cdot \tan B \cdot \tan C$.
- (b) Prove that $\sin^{-1} \frac{3}{5} + \sin^{-1} \frac{8}{17} = \cos^{-1} \frac{36}{85}$.

13. (a) Solve $\sin^* \sin 2 \sin 3 = 0$.
- (b) In $\triangle ABC$, prove that if $A = 60^\circ$, then $\frac{c}{a} + \frac{b}{c} + \frac{a}{b} = 1$.
14. (a) Find the equation of the parabola, whose focus is $(8, 8)$ and vertex is $(2, 8)$.
- (b) Find the eccentricity, foci, length of latus rectum and directrices of the ellipse $9x^2 + 16y^2 = 144$.
15. (a) Find the equation of a rectangular hyperbola, whose focus is the point $(-1, -3)$ and directrix is the line $x + 2y + 7 = 0$.
- (b) Find the centroid of the tetrahedron formed by the points $(4, -2, 3)$, $(6, 1, 7)$, $(4, 2, 3)$ and $(5, 0, -2)$.
16. (a) Find $\frac{dy}{dx}$, if $y = \sqrt{\cos x} \sqrt{\cos x} \sqrt{\cos x} \dots$ to ∞ .
- (b) Verify Euler's theorem, when $f(x, y, z) = xy + yz + zx$.
17. (a) Find the lengths of the tangent, normal, subtangent and subnormal to the curve $x^2 + y^2 = 9$ at the point $(5, 4)$.
- (b) The displacement(s) of a particle is given at any time t by the relation $s = 2t^3 + 15t^2 + 36t + 70$. Find its (i) initial velocity, and (ii) time when velocity is zero.
18. (a) Find the dimensions of a rectangle of maximum area having a perimeter 36 ft.
- (b) The radius of a spherical balloon is increased by 1%. Find the approximate percentage increase in its surface area.
