



C09-A-102/C09-AA-102/C09-AEI-102/C09-C-102/
C09-CM-102/C09-CH-102/C09-CHST-102/
C09-EC-102/C09-EE-102/C09-FW-102/C09-IT-102/
C09-M-102/C09-MET-102/C09-MNG-102/
C09-PKG-102/C09-TT-**102**

3002

BOARD DIPLOMA EXAMINATION, (C-09)
MARCH/APRIL—2018
DCME—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. If

$$x - \frac{1}{x} = 7$$

find the value of $x^3 - \frac{1}{x^3}$.

2. Rationalize the denominator of

$$\frac{\sqrt{13} - \sqrt{5}}{\sqrt{13} + \sqrt{5}}$$

3. Resolve

$$\frac{1}{(x-7)(x-3)}$$

into partial fractions.

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4. If $A + B + C = 90^\circ$, prove that $\cot A + \cot B + \cot C = \cot A \cot B \cot C$.

5. Show that

$$\frac{\cos 2}{1 - \sin 2} = \tan \frac{\pi}{4}$$

6. Find the modulus of

$$\frac{3 - 4i}{1 - 7i}$$

7. Find the equation of the straight line passing through the point (3,-4) and perpendicular to the line $x - 5y - 1 = 0$.

8. Find the equation of the point circle with centre (5,-2).

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sin 33x}{\tan 11x}$$

10. Differentiate $x^2 \sec 3x$.

PART—B

10×5=50

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

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

11. (a) Using Laplace's expansion evaluate

$$\begin{vmatrix} p & q & r \\ r & p & q \\ q & r & p \end{vmatrix}$$

(b) Find the adjoint of

$$\begin{vmatrix} 2 & 3 & 1 \\ 4 & 0 & 3 \\ 3 & 1 & 7 \end{vmatrix}$$

12. (a) If $A + B + C = 180^\circ$, show that

$$\sin 2A + \sin 2B + \sin 2C = 4 \sin A \cos B \cos C$$

(b) Prove that

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

13. (a) Solve :

$$2 \cos^2 \theta - 1 = \sin \theta$$

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

$$\cot A = \frac{R(a^2 + b^2 - c^2)}{abc}$$

14. (a) Find the vertex, focus and directrix of the parabola $(x - 8)^2 = 24(y - 3)$.

(b) Find the equation of the ellipse which passes through the points $(-2, 1)$ and $(-1, 3)$ with axes as coordinate axes.

15. (a) Find the equation of the rectangular hyperbola whose focus is $(5, -3)$ and directrix is $x - 2y - 7 = 0$.

(b) Find the perimeter and centroid of the triangle formed by the points $(7, -4)$, $(1, -6)$, $(5, -1)$.

16. (a) Find

$$\frac{dy}{dx}$$

$$\text{if } x = a(1 - \sin y) \text{ and } y = a(1 - \cos x)$$

(b) If

$$y = \sqrt{\sqrt{x} + \sqrt{\sqrt{x} + \sqrt{\sqrt{x} + \dots \text{to } \infty}}$$

show that

$$\frac{dy}{dx} = \frac{1}{2\sqrt{x}(2y - 1)}$$

17. (a) For any curve, show that

$$\frac{\sqrt{\text{subtangent}}}{\sqrt{\text{subnormal}}} = \frac{\text{length of tangent}}{\text{length of normal}}$$

(b) Each side of a square increases at the rate of 1.3 cm/sec. Find the rate at which the area of the square increases when the side is 14 cm. Also find the rate at which perimeter increases.

18. (a) Find the dimensions of a rectangle of maximum area having a perimeter of 42 ft.

(b) If an error of 0.02 cm is made in measuring radius 10 cm of a sphere, find approximate percentage error in the surface area of the sphere.
