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C14-C/CM-102

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BOARD DIPLOMA EXAMINATION, (C-14)

MARCH/APRIL—2017

DCE—FIRST YEAR 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 $\frac{1}{(x-5)(x-7)}$ into partial fractions.

2. If $\frac{x-3}{z-2} = \frac{x-4y}{x-z} = \frac{5}{4} = \frac{2}{4}$, find x, y, z .

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

4. Prove that $\sin^2 45^\circ - \sin^2 15^\circ = \frac{\sqrt{3}}{4}$.

5. Show that $\frac{\tan 2}{1 - \sec 2} = \tan \dots$

6. Express $\frac{2 - 5i}{4 + 3i}$ in the form of $a + ib$.

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

8. Find the equation of the point circle whose centre is (3, 4).

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sin 7x}{\sin 11x}$$

10. Find the derivative $e^{3x} \sin 2x$ of 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) Show that $\begin{vmatrix} a & a^2 & a^3 \\ b & b^2 & b^3 \\ c & c^2 & c^3 \end{vmatrix} = abc(a-b)(b-c)(c-a)$.

(b) Solve the equations by Cramer's rule

$$x + 2y + z = 1, 2x + y + 2z = 1, x + y + z = 2$$

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

$$\cos 2A + \cos 2B + \cos 2C = 1 - 4 \cos A \cos B \cos C$$

(b) Prove that $\tan^{-1} \frac{1}{4} + \tan^{-1} \frac{3}{5} = \frac{\pi}{4}$.

13. (a) Solve the equation $2\sin^2 \theta - \sin \theta - 1 = 0$.

(b) In any triangle ABC , prove that

$$\sin A \sin B \sin C = \frac{S}{R}$$

14. (a) Find the vertex, focus, directrix, axis and length of latus rectum of the parabola $y^2 = 16x$.

(b) Find the equation of the ellipse, eccentricity $\frac{1}{2}$ whose focus is the point $(3, 1)$ and directrix is the line $x - y - 6 = 0$.

15. (a) Find $\frac{dy}{dx}$ if $y = (\sin x)^{\tan x}$.

(b) If $y = \sqrt{\sin x} \sqrt{\sin x} \sqrt{\sin x} \dots$ terms, show that

$$\frac{dy}{dx} = \frac{\cos x}{2y - 1}$$

16. (a) If $y = \log(x + \sqrt{1 + x^2})$, show that $(1 + x^2)y_2 - xy_1 = 0$.

(b) If $u = \sin^{-1} \frac{x^2 - y^2}{x + y}$, show that $x \frac{u}{x} - y \frac{u}{y} = \tan u$.

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

(b) The radius of a circle is increasing at the rate of 2 cm/sec. Find the rate of change of area when the radius is 24 cm.

18. (a) Find the maximum and minimum values of

$$2x^3 - 9x^2 + 12x + 15$$

(b) Find the approximate value of $\sqrt[3]{123}$.
