



C14-A-102/C14-AA-102/C14-BM-102/
C14-CH-102/C14-CHST-102/C14-AEI-102/
C14-MNG-102/C14-MET-102/C14-IT-102/
C14-TT-102/C14-PCT-**102**

4002

BOARD DIPLOMA EXAMINATION, (C-14)
MARCH/APRIL—2017
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. Resolve $\frac{1}{(x-1)(x-2)}$ into partial fractions.

2. Evaluate :

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

3. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 4 \\ 4 & 5 \end{pmatrix}$, find AB and BA .

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

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5. If $A + B + C = 90^\circ$, then prove that

$$\tan A \tan B + \tan B \tan C + \tan C \tan A = 1$$

6. Find the real and imaginary parts of $\frac{4 - 2i}{1 - 2i}$.

7. Find the equation of the straight line passing through the points (1, -2) and (-2, 3).

8. Find the centre and radius of the circle $x^2 + y^2 - 6x - 4y - 12 = 0$.

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sin 37x}{\sin 11x}$$

10. Find $\frac{dy}{dx}$, if $y = \sin x + \cos x + \frac{2}{x} \log x$.

PART—B

10×5=50

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

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

11. Solve $x + y + z = 6$, $x - y + z = 2$ and $2x + y + z = 1$ by using matrix inversion method.

12. (a) Prove that $\sin^{-1} \sin(60^\circ) = \sin(60^\circ) = \frac{1}{4} \sin 3^\circ$.

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

$$x^2 + y^2 + z^2 - 2xyz = 1$$

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13. (a) Solve $\sin 5^\circ = \sin \theta = \sin 3^\circ$.

(b) In a triangle ABC , prove that $\sin A = \sin B = \sin C = \frac{S}{R}$.

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14. (a) Find the equation of the parabola whose axis is parallel to the x -axis and which passes through the points $(2, 0)$, $(0, 4)$ and $(-1, 2)$

(b) Find the equation of the rectangular hyperbola whose focus is the point $(1, 3)$ and directrix is the line $2x - y - 1 = 0$.

15. (a) If $y = x^{x^{\dots}}$ terms, prove that $\frac{dy}{dx} = \frac{y^2}{x(1 - y \log x)}$.

(b) Find $\frac{dy}{dx}$, if $x^2 + y^2 = 2axy - 1$.

16. (a) Verify Euler's theorem for the function $Z = ax^2 + 2hxy + by^2$.

(b) If $u = \tan^{-1} \frac{x^3 - y^3}{x - y}$, prove that $x \frac{u}{x} + y \frac{u}{y} = \sin 2u$.

17. (a) Find the angle between the curves $x^2 + y^2 = 8$ and $x^2 = 2y$.

(b) A particle is moving along a straight line according to the law $S = 2t^3 - 3t^2 + 15t + 18$ (t is in sec). Find its velocity when its acceleration is zero.

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

$$f(x) = 2x^3 - 9x^2 + 12x + 15$$

(b) The time T of a complete oscillation of a simple pendulum of length l is given by the equation $T = 2\sqrt{l/g}$, where g is constant. Find the approximate percentage error in the calculated value of T corresponding to an error 2% in the value of l .

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