



C16-A/AA/CHST/C/CM/EC/EE/M/
AEI/MNG/IT/PKG-102

5002-A

BOARD DIPLOMA SUPPLEMENTARY (INSTANT)
EXAMINATION, (C-16)

JUNE - 2019

FIRST YEAR (COMMON) EXAMINATION
ENGINEERING MATHEMATICS - I

Time : 3 Hours]

[Total Marks : 80

PART - A

2×15=30

Instructions :

- (1) Answer any 15 questions.
- (2) Each question carries 2 marks.
- (3) Answer should be brief and straight to the point and shall not exceed five simple sentences.

1 Find the value of $\log_3 27$.

2 Resolve $\frac{1}{(x+4)(x+3)}$ into partial fractions.

3 Define Proper Fraction and give an example.

4 Define symmetric matrix.

5 If $A = \begin{bmatrix} 1 & 7 \\ 7 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$ find $A - B$.

6 If $A = \begin{bmatrix} 2 & 4 \\ -1 & k \end{bmatrix}$ and $A^2 = 0$, find k .

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[Contd...

- 7 Write the formula of $\sin(A+B)$ and $\sin(A-B)$.
- 8 Show that $\frac{1+\cos 2A}{\sin 2A} = \cot A$.
- 9 State Sine rule.
- 10 Write the formula of $\tan 2A$ and $\tan 3A$.
- 11 Express $\frac{1+i}{1-i}$ in the form of $a+ib$.
- 12 Find the additive inverse of $7+4i$.
- 13 Write the intercept form of the straight line $4x+3y-5=0$.
- 14 Write the formula to find the perpendicular distance from a point (x_1, y_1) to straight line $ax+by+c=0$.
- 15 Find the equation of the circle with centre $(3, 5)$ and radius 5 units.
- 16 Find the centre and radius of the circle $x^2+y^2-2x+6y-11=0$.
- 17 Find $\lim_{x \rightarrow 0} \frac{\sin 3x}{x}$.
- 18 Find $\lim_{x \rightarrow 5} \frac{x^3-125}{x-5}$.
- 19 Differentiate $x \sin x$ w.r.t. x .
- 20 Differentiate $e^{2x} + \log x$.

PART - B

10×5=50

- Instructions :**
- (1) Answer any **FIVE** questions.
 - (2) Each question carries **TEN** marks.
 - (3) Answer should be comprehensive and criterion for valuation is the content but not the length of the answer.

- 21 (a) Solve the equations by Cramer's rule :

$$2x - 3y + z = -1; \quad x + 4y - 2z = 3 \quad \text{and} \quad 4x - y + 3z = 11$$

(b) Prove that

$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3.$$

22 (a) Prove that $\frac{\sin A + \sin 3A + \sin 5A + \sin 7A}{\cos A + \cos 3A + \cos 5A + \cos 7A} = \tan 4A.$

(b) Prove that $\frac{\cos 37^\circ + \sin 37^\circ}{\cos 37^\circ - \sin 37^\circ} = \cot 8^\circ.$

23 (a) If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$, then prove that $x + y + z = xyz.$

(b) Prove that $\sin^{-1} \frac{3}{5} + \sin^{-1} \frac{5}{13} = \tan^{-1} \frac{56}{33}.$

24 (a) Find the angle between the straight lines $2x - y + 3 = 0$ and $x + y - 2 = 0.$

(b) Find the equation of the circle passing through the points (0, 0); (6, 0) and (0, 8).

- 25 (a) Find $\frac{dy}{dx}$, if $y = x^{x^{x^{\dots\infty}}}$.
- (b) Find $\frac{dy}{dx}$ if $y = \sin^{-1} (3x - 4x^3)$.
- 26 (a) Find $\frac{dy}{dx}$ if $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$.
- (b) Evaluate $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$ if $u = x^2y - x \sin xy$.
- 27 (a) Find the equations of the tangent and normal to curve $y^2 = 4ax$ at the point $(at^2, 2at)$.
- (b) Show that the curves $4x^2 + 9y^2 = 72$, $x^2 - y^2 = 5$ cut each other orthogonally.
- 28 (a) If the sum of two numbers is 24 find them if the sum of their squares is to be minimum.
- (b) Find the maximum and minimum values of $2x^3 - 9x^2 + 12x + 10$.
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