Duration: 2 Hours   **Total Marks: 50**

Instructions:
1) Figures to the right indicate maximum marks
2) Start each answer on a fresh page.
3) Non scientific, non programmable calculator allowed.

1. **Attempt the following**

   A. Fill in the blanks: **[1x5=5 Marks]**
      - i.   The lcm of 125 and 370 is _____
      - ii.   The distance between (3,1) and (5,2) is _____
      - iii.   Area of triangle with base 20 cm and the height 7cm is _____
      - iv.   If $f(x)=x^2-2x+3$ $0<x<4$; then $f(5)=$_____
      - v.   In a GP if a=6 and $r = \frac{1}{3}$ then $T_5=$_____

   B. Answer the following   **[1x5=5 Marks]**
      - i.   Find $\lim_{x\to 0} \frac{\sin 5x}{3x}$
      - ii.   If $f(x)=x^2$ and $g(x)=x+1$ then find $f[g(x)]$
      - iii.   Find $\frac{dy}{dx}$ if $y = x^3 - 3x^2 + 5$
      - iv.   Define Harmonic Progression
      - v.   Write any two laws of indices

2. **Answer any two of the following questions**   **[2x5=10 Marks]**

   A. If for an AP $T_3=9$ and $T_7=5$, find T_{10}.

   B. Use matrix inversion method to solve the following system of equations
   $$2x + 8y + 5z = 5, \quad x + y + z = -2, \quad x + 2y - z = 2$$

   C. Define the dot product and cross product and hence find $\vec{a}.\vec{b}$ and $\vec{a} \times \vec{b}$ if
   $\vec{a} = 2\hat{i} + 3\hat{j} + 6\hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + 3\hat{k}$

3. **Answer any two of the following questions**   **[2x5=10 Marks]**

   A. If $\log_2 x + \log_4 x + \log_{16} x = \frac{21}{4}$ find x

   B. Find the equation of the line
      - i.   Passing through (3,5) and having slope -2.
      - ii.   Having x-intercept 2 and y-intercept -3

C. The base of a prism is a triangle of which sides are 50cm, 78cm and 112 cm respectively. The volume of the prism is 33600 cubic cm. What is its height? Find its lateral surface area.

4. **Answer <u>any two</u> of the following questions**   [2x5=10 Marks]
   A. Evaluate the following limits
      i. $\lim_{x \to 2} \dfrac{x^5-32}{x^2-4}$
      ii. $\lim_{x \to \infty} \dfrac{x^4-3x^2+x-2}{3x^4-2x^2+1}$
   B. Find the derivative of
      i. $y = 4x^5 - 3^x = \log x - 7$
      ii. $y = (x+2)e^x$
   C. i. Prove that $1+\cot^2\emptyset = \csc^2\emptyset$
      ii.convert $30^0, 45^0, 60^0, 90^0, 270^0$ into radians

5. **Answer <u>any two</u> of the following questions**   [2x5=10 Marks]
   A. Find the following integrals
      i. $\int_2^3 (xe^x)dx$
      ii. $\int (x-2)(x+3)dx$
   B. If A=$\begin{bmatrix} 2 & 4 & 6 \\ 1 & 1 & 2 \\ 3 & 5 & 0 \end{bmatrix}$ find A^2-5A+3I
   C. Solve the following quadratic equation

   $2x^2 - x + \frac{1}{8} = 0$