October 2025
B.A./B.Sc.
First Semester
MULTI-DISCIPLINARY COURSE – 1
MATHEMATICS
Course Code: MAO 1.11
(Introductory Mathematics)

Total Mark: 50 *Pass Mark: 20*
Time: 2 hours

I. Answer three *questions, taking* one *from each unit.*

UNIT–I

1. (a) Using trigonometric identities show that:
$\sin 4A = 4\sin A\cos A - 8\cos A\sin^3 A$ 3

(b) Find the principal solution and general solution of $\cos\theta = \frac{\sqrt{3}}{2}$. 4

(c) A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal. 5

2. (a) Using trigonometric identities, show that:

(i) $\sin A\sin(60° - A)\sin(60° + A) = \frac{1}{4}\sin 3A$ 3

(ii) $\frac{\sin x - \sin y}{\cos x + \cos y} = \tan\frac{(x-y)}{2}$ 4

(b) A TV tower stands vertically on a bank of a canal. From a point A on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60°. From another point B, 20 m away from A, the angle of elevation of the top of the tower is 30°. Find the height of the tower and the width of the canal from the tower to point A. 4+1=5

UNIT–II

3. (a) Write all the subsets of $A=\{a,b,c\}$. 2

   (b) Factorize $(lm+l)+m+1$. 3

   (c) Solve the given pair of simultaneous linear equations: 4

   $5x+y=10$

   $7x-3y=14$

   (d) Expand the expression $\left(\frac{2}{x}-\frac{x}{2}\right)^5$. 3

4. (a) If $A=\{3,5,7,9,11\}$, $B=\{7,9,11,13\}$, $C=\{11,13,15\}$, $D=\{15,17\}$. Find 4

   (i) $A\cup B$

   (ii) $A\cap(B\cup D)$

   (iii) $A\cap C\cap D$

   (iv) $(A\cap B)\cup(C\cap D)$

   (b) Find the sum of the first 5 terms of the AP with first term 3 and common difference 2. 3

   (c) Express the partial fraction $\frac{6x^2+x-7}{(x-2)^2(x-3)}$. 5

UNIT–III

5. (a) Find the limits of any two of the following: 4

   (i) $\lim\limits_{x\to 1}(x+3)$

   (ii) $\lim\limits_{x\to 3}\left(\frac{x^2-9}{x-3}\right)$

   (iii) $\lim\limits_{x\to 2}(x^3-1)$

   (b) Let $f(x)=\begin{cases}-2, & \text{if } x\le -1\\ 2x, & \text{if } -1<x\le 1\\ 2, & \text{if } x\ge 1\end{cases}$

   Discuss the continuity of the function at $x=-1$ and at $x=-1$. 4

(c) Find $\int \frac{1}{(x+1)(x+2)} dx$. 4

6. (a) Find $\frac{dy}{dx}$ when $2x+3y=\sin x$. 3

(b) Is the function f defined by $f(x)=\begin{cases} x, & \text{if } x \le 1 \\ 5, & \text{if } x > 1 \end{cases}$ continuous at $x=1$? 4

(c) Find $\int \frac{3x-2}{(x+1)^2(x+3)} dx$. 5

II. Answer any two *questions from the following.*

7. (a) Find the principal solution and the general solution of $\sin x = \frac{\sqrt{3}}{2}$. 3

(b) From the top a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the cable tower. 4

8. Find the trace, transpose, and the inverse of the matrix

$$A=\begin{bmatrix} 1 & 0 & 2 \\ -1 & 3 & 1 \\ 3 & 4 & 0 \end{bmatrix}$$ 1+1+5=7

9. Find the integral of the following:

(a) $\int \frac{x^2+1}{x^2-5x+6} dx$ 4

(b) $\int \sin^3 x \cos^2 x dx$ 3