

M.SC. MATHEMATICS
THIRD SEMESTER
NUMBER THEORY
MSM – 302

[USE OMR FOR OBJECTIVE PART]

2025/11

**SET
A**

Duration: 1:30 hrs.

Full Marks: 35

Time: 15 mins.

Marks: 10

(Objective)

Choose the correct answer from the following:

1×10=10

1. The value of $111^{333} + 333^{111} \pmod{7}$ is
 - a. -1
 - b. 0
 - c. 1
 - d. 2
2. The value of $1! + 2! + 3! + 4! + \dots + 100! \pmod{12}$ is
 - a. 0
 - b. 6
 - c. 9
 - d. None of these
3. If r is a primitive root of a prime p , then
 - a. $r^{\frac{p-1}{2}} \equiv -1 \pmod{p}$
 - b. $r^{\frac{p-1}{2}} \equiv 1 \pmod{p}$
 - c. $r^{\frac{p-1}{2}} \not\equiv \pm 1 \pmod{p}$
 - d. None of these
4. Which of the following integer has no primitive roots:
 - a. 21
 - b. 25
 - c. 32
 - d. None of these
5. If 2 is a primitive root of 13, then which of the following is/are quadratic residue of 13:
 - a. 6
 - b. 8
 - c. 7
 - d. 9
6. The number of solutions of the congruence $18x \equiv 30 \pmod{42}$ is
 - a. 1
 - b. 2
 - c. 5
 - d. 6
7. Which of the following congruence has no solution?
 - a. $9x \equiv 20 \pmod{30}$
 - b. $9x \equiv 24 \pmod{30}$
 - c. $9x \equiv 21 \pmod{30}$
 - d. None of these
8. Which of the following Diophantine equations has solution?
 - a. $56x + 72y = 13$
 - b. $24x + 138y = 625$
 - c. $172x + 20y = 1000$
 - d. None of these

9. The 3rd convergent of $[0; 2, 1, 2, 6]$ is
 a. $\frac{1}{3}$
 b. $\frac{3}{8}$
 c. $\frac{1}{2}$
 d. None of these
10. The value of $5^{38} \pmod{11}$ is
 a. 0
 b. 1
 c. 4
 d. 5

Descriptive

[Answer question no.1 & any two (2) from the rest]

- b. Determine the rational numbers represented by the following simple continued fractions. Also, compute the convergents.

$$[0; 1, 2, 3, 4, 3, 2, 1]$$

5. a. Evaluate each of the following infinite simple continued fractions:

(i) $[1; 1, 1, 1, \dots]$

(ii) $[0; \overline{1, 2, 3}]$

$$\frac{3+3+4}{=10}$$

- b. Determine the infinite continued fraction representation of the following irrational number: $\sqrt{7}$

$$= = *** = =$$