

**CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS**

**II-B.TECH-I-Semester End Examinations (Supply) - December- 2024
NUMBER THEORY & STATISTICAL METHODS
(CSC)**

[Time: 3 Hours]

[Max. Marks: 70]

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 20 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A**(20 Marks)**

1. a) What is the value of correction factor if $n=5$ and $N=200$. [2M]
- b) Define Population and Sample. [2M]
- c) Explain Alternative hypothesis. [2M]
- d) Define Type-I error and Type-II error. [2M]
- e) Define GCD. [2M]
- f) State the Fundamental theorem of arithmetic. [2M]
- g) State Chinese Remainder Theorem. [2M]
- h) Solve the congruence $21x \cong 9 \pmod{5}$. [2M]
- i) State Euler's Theorem. [2M]
- j) State Fermat's little theorem. [2M]

PART-B**(50 Marks)**

2. Find 95% confidence limits for the mean of a normality distributed population from which the Following sample was taken 15,17,10,18,16,9,7,11,13,14. [10M]
- OR**
3. A population consists of the four numbers 2, 3, 6, 8. Consider all possible samples of size Two that can be drawn with replacement from this population. Find [10M]
 - (i) The population means.
 - (ii) The population standard deviation.
 - (iii) The mean of the sampling distribution of means.
 4. A random sample of size 64 is taken from an infinite population having the mean 45 and the standard deviation 8. What is the probability that sample mean will be between 46 and 47.5. [10M]
- OR**
5. An oceanographer wants to check whether the depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the $\alpha = 0.05$ level of significance, if reading taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with a standard deviation of 5.2 fathoms? Also calculate 95 % confidence interval. [10M]
 - 6.a) If p is a prime and $p|ab$ then show that $p|a$ or $p|b$. [10M]
 - b) Using the canonical decompositions of 720 and 8800, find their gcd and lcm.
- OR**
7. By Using Euclidean Algorithm find GCD of 26&18 and express in the form linear combination. [10M]

8. Solve the following 2X2 linear system. [10M]
 $5x+11y \cong 8 \pmod{13}$,
 $11x+5y \cong 9 \pmod{13}$

OR

9. Using Chinese Remainder Theorem , solve the following system [10M]
 $x \cong 1 \pmod{2}$,
 $x \cong 2 \pmod{3}$,
 $x \cong 3 \pmod{5}$

10. State and prove Wilson Theorem. [10M]

OR

11. Prove that $(16 + 21)^{23} = 16^{23}+21^{23} \pmod{23}$. [10M]
