

Code No.: MA305BS

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**CMR ENGINEERING COLLEGE: : HYDERABAD**  
**UGC AUTONOMOUS**  
**II-B.TECH-I-Semester End Examinations (Supply)- June- 2022**  
**NUMBER THEORY & STATISTICAL METHODS**  
**(CSC)**

[Time: 3 Hours]

[Max. Marks: 70]

**Note:** 1. Answer any FIVE questions. Each question carries 14 marks.

2. All questions carry equal marks.

3. Illustrate your answers with NEAT sketches wherever necessary.

5X14=70

1. The pulse rate of 50 yoga practitioners decreased on the average by 20.2 beats/minute with s.d. of 3.5. [14M]
  - i. If  $\bar{x} = 20.2$  is used as a point estimate of the true average decrease in the pulse rate, what can we assert with 95% confidence about the maximum error E.
  - ii. Construct 99% confidence interval for the true average decrease in pulse rate.
  - iii. How large a sample should we take in order to assert with 95% confidence that the mean of the sample is off by at most 0.50?
  
2. a) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5 inches? [7M]  
b) If 57 out of 150 patients suffering with certain disease are cured by allopathy and 33 out of 100 patients with same disease are cured by homeopathy, is there any reason to believe that allopathy is better than homeopathy at 0.05 level of significance. [7M]
  
3. a) Show that if  $(a, m) = (b, m) = 1$ , then  $(ab, m) = 1$ . [7M]  
b) Using Euclidean Algorithm, find the g.c.d. of 2947 and 3997. [7M]
  
4. a) i. Find the remainder when  $3^{247}$  is divided by 17 [3+4  
ii. Solve the congruence  $12x \equiv 48 \pmod{18}$ . M]  
b) Using the Chinese Remainder Theorem, solve [7M]  
 $x \equiv 1 \pmod{3}$ ,  $x \equiv 2 \pmod{5}$ , and  $x \equiv 3 \pmod{7}$
  
5. a) i. State and prove Wilson's Theorem. [4+3  
ii. Show that if  $n$  is a positive integer such that  $(n-1)! \equiv -1 \pmod{n}$ , then  $n$  is a prime. M]  
b) Using Euler's theorem, find the ones digit in the decimal value of  $17^{6666}$ . [7M]
  
6. A population consists of the five numbers 3, 6, 9, 15, and 27. Consider all possible samples of size 3 that can be drawn without replacement from this population. [14M]  
Find
  - i. the mean of the population,
  - ii. the standard deviation of the population,
  - iii. the mean of the sampling distribution of means, and
  - iv. The standard deviation of the sampling distribution of means.

7. a) Explain the null hypothesis and alternate hypothesis. [4M]  
b) A pair of dice is thrown 360 times and the frequency of each sum is indicated below [10M]

Sum	2	3	4	5	6	7	8	9	10	11	12
Frequency	8	24	35	37	44	65	51	42	26	14	14

Would you say that the dice are fair on the basis of the Chi-Square test at 0.05 level of significance?

8. a) Show that there are infinitely many primes. [7M]  
b) Arrange the hexadecimal numbers 1076, 3056, 3CAB, 5ABC, and CACB in order of increasing magnitude. [7M]