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S.Y. B.Sc. (COMPUTER SCIENCE)
MATHEMATICS (Paper - I)
MTC - 231: Groups and Coding Theory
(Semester-III) (2019 Pattern) (23221)

Time : 2 Hours]　　　　　　　　　　　　　　　　　　*[Max. Marks : 35*

Instructions to the candidates :

　　1)　All questions are compulsory.

　　2)　Figures to the right indicate full marks.

　　3)　Non-programmable scientific calculator is allowed.

Q1) **Attempt any Five of the following:**　　　　　　　　**[5 × 2 = 10]**

　　a)　Prepare composition table for addition on Z_5.

　　b)　State whether the following statement is True or False:
　　　　'Union of two subgroup is subgroup' Justify.

　　c)　Check whether the permutation $\delta = (1,7,2,5)$ is even or odd? Justify.

　　d)　Find remainder after dividing 111'" by 2.

　　e)　Find Hamming distance between x and y, where, $x = 1101$ and $y = 0111$.

　　f)　Let a,b,c $\in Z$, if a|b and b|c then show that a|c.

　　g)　State whether the following statement is True or False:
　　　　'Every cyclic group is an abelian group' Justify.

Q2) **Attempt any Three of the following***:* [3 × 5 = 15]

a) Find gcd of 687 and 819. Find integers m and n such that (819,687) =m(819) +n (687).

b) If μ = (2,3) (4,5); σ= (1,3) (2,4); τ= (1,2,3) (4,5) in S_5 then find $\mu(\tau\sigma)^{-1}$.

c) State and prove Euclids Lemma.

d) Using encoding function, $f(x) = x+3$ (mod 26) encode the word 'MATH'.

e) Let a,b $\in$ Z, if the binary operation '∗' is defined as a∗b = a+b–ab, then show that G is an abelian group under operation '∗'

Q3) **Attempt any One of the following:** [1 × 10 = 10]

a) i) Let a,b,x,y $\in$ Z, if $a \equiv b$ (mod n) then

prove that, I) $ax \equiv bx$ (mod n)

II) $(a+x) \equiv (b+x)$ (mod n)

ii) Let R be relation on Z defined as xRy if and only if $5x + 6y$ is divisible by 11. Show that R is an equivalence relation on Z

b) Let p=11,q=3. Using RSA method to encode the word 'CENTRE', take e=7.

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