

Total No. of Questions : 3]

SEAT No. :

P-1290

[Total No. Of Pages : 2

[6055]-103

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^{100} 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.

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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 $\mu = (2,3) (4,5)$; $\sigma = (1,3) (2,4)$; $\tau = (1,2,3) (4,5)$ in S_5 then find $\mu(\tau\sigma)^{-1}$.
- c) State and prove Euclid's Lemma.
- d) Using encoding function, $f(x) = x+3 \pmod{26}$ encode the word 'MATH'.
- e) Let $a, b \in \mathbb{Z}$, 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 $a, b, x, y \in \mathbb{Z}$, if $a \equiv b \pmod{n}$ then
prove that, I) $ax \equiv bx \pmod{n}$
II) $(a+x) \equiv (b+x) \pmod{n}$
ii) Let R be relation on $\mathbb{Z}$ defined as xRy if and only if $5x + 6y$ is divisible by 11. Show that R is an equivalence relation on $\mathbb{Z}$.
- b) Let $p=11, q=3$. Using RSA method to encode the word 'CENTRE', take $e=7$.

