



(An Autonomous Institution)

Coimbatore-641035.

UNIT 4- ALGEBRAIC STRUCTURES

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If show that the Set GI = {1,-1, i, -iz consulting of the 4th roots of wilty so a commutative
 gloup under maltiplacation.
 Soln :
    Ma Haplacation (Cayley) Table
 i). clasure: Now 1,-1861, +1*-1=-1861
            - 61 98 closed.
 ii) Associative: 1, -1, i & G1 (1*-1) + i = -i & G1
                               1*(-1*i) = -16 G
     : (1米ーワャリニ 1米 (一米))
     It Sattsfee the associativity
 iii). Identity Elt.: For 1,-1, i, -i & G
     1*1=1, -1*+1=1, 1*+1=1, -1*1=1
      . is the Polentity out.
  iv) Inverse ett.:
       Invelse of -1 95 -1 20.0 -1 *-1 =1 EG,
       Inverse of 1 & 1 ie, 1 * 1 = 1 & G
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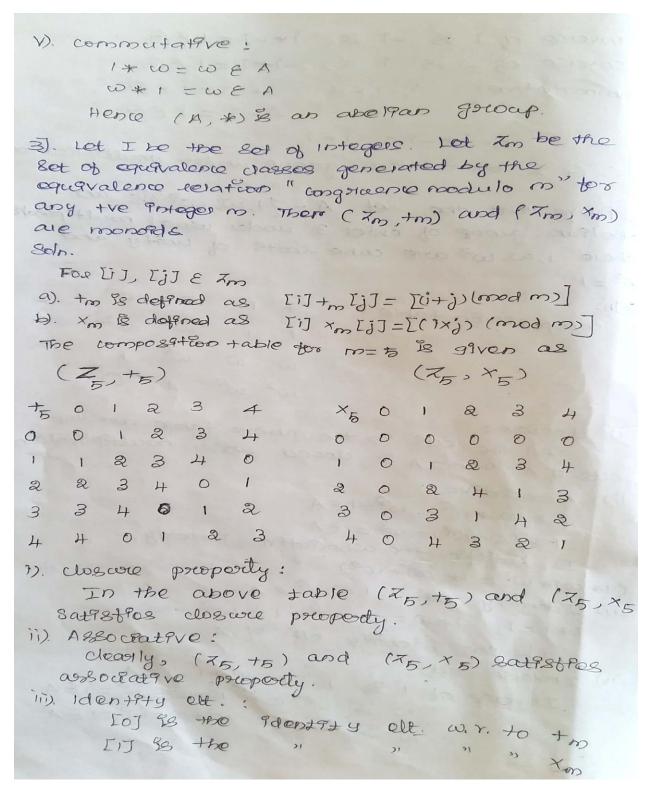
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inverse of i & -i ie. ix-i=1861
  Inverse of -1 18 1 ce, -1+1=1 EG,
v). commutative: 1,-186 1*-1=1861
                          -1+1=1EG
   ショナーラニー・ラップ
  .. 61 98 commutative group under unultiplication.
a) Prove that the let A = {1, w, coigh an
Vabel9an geoup of order 3 under usual multiplication
where 1,00, we will cube loots of withy and
\omega^3 = 1
Soln-
   compossation table
                         1 1 2 002
                          w w w 1
      All the cits. 90 the above table are the
 i). clos wie:
 elts. 9 A. Hence A 98 closed ander roceltiplication
 ii). Assocative:
    (1*w) * 00 = 00 = 18A
    1 * ( \omega * \omega^2) = \omega^3 = 18 A
     It satisfies the associative property.
 (1*00)*w2 = 1* (0 * co2)
 iii). Identify elt.: 1,00,00 EA
    1*1=1, 1*0=0, 02 *1= w2
       ) is the identity elf. of A
 iv). Invoise elt.
      Inverse of 1 % 1 is, 1*1=1 EA
                 w is we ie, wxw2= w3=1€A
                 w 2 2 w w w + 10 = w3 = 1 € A
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Groups

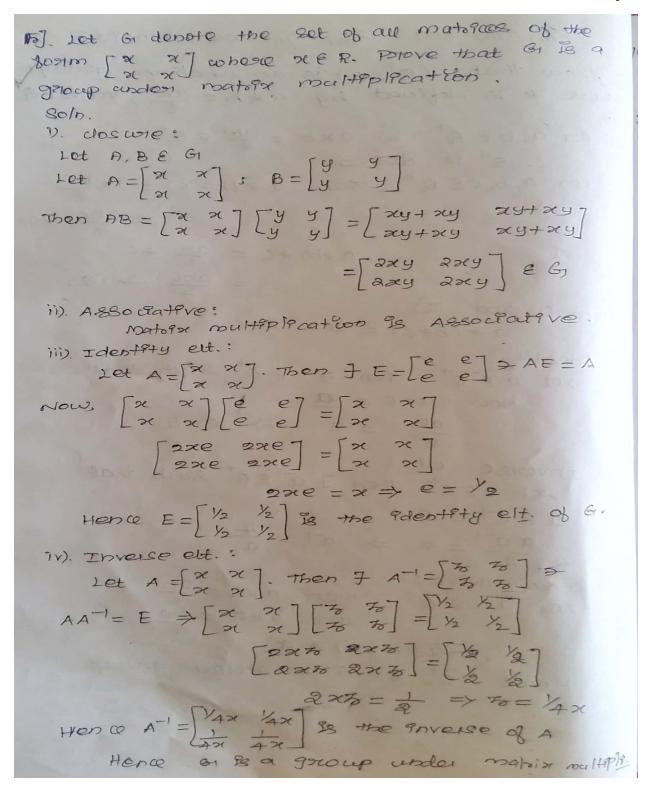
: (Zm, +m) and (Zm, xm) are monogds, 4. Show that (Qt *) 98 an abelian group where * 98 defined by Q*b= ab , tabeat 20/0. i). For a, b & a => a * b = ab & at i. Q' & dosed ii). For a,b,CEa^{\dagger} . Then a*(b*c) = a*bc(a*b) *c = ab *c $=\frac{abc}{4}\rightarrow (2)$ Form (1) and (2), a*(b*c) = (a*b)*C iii) Identity: Let a E Qt. Then I e E Bt Such that NOW axe = 0 $ae = a \Rightarrow e = a$ Let a E at. Then I a E at such that iv). Invoyse elt.: 0 * 2 = 0 $\frac{aa'}{a} = a \Rightarrow a' = \frac{4}{a}$ V). commutative: 1et $a, b \in a^{\dagger}$. Then $a*b = \frac{ab}{a}$ and $b*a = \frac{ba}{a}$ · a*b= b* a Hence (at, *) is an abellan group.





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thu. S.T. (R-213, #) & an abelgan goloup, where * & defined by a*b=a+b+ab, +a, bER