TELANGANA UNIVERSITY

S.S.R. DEGREE COLLEGE, NIZAMABAD (C.C:5029)

IV SEMESTER INTERNAL ASSESSMENT I EXAMINATIONS

MATHS (ALGEBRA) QUESTION BANK

I. Multiple choice questions.

1. For a, b, c $\in$ group (G,) $(abc)^{-1}$ = ______________ [c]

(a) $a^{-1}\, b^{-1}\, c^{-1}$ (b) cba (c) $c^{-1}\, b^{-1}\, a^{-1}$ (d) $c^{-1}\, a^{-1}\, b^{-1}$

2. If in a group a is an element of order 5 and x is an element of order 2 then x^{-1} is an element of order [a]

(a) 5 (b) 2 (c) 7 (d) 3

3. In a finite group G, the order of each element of G [a]

(a) Divides the order of G (b) Multiplies the order of G

(c) Adds with the order of G (d) None

4. The number of elements in the alternating group A_4 is __________ [a]

(a) 12 (b) 8 (c) 4 (d) 3

5. In any group G the number of identity elements is ___________ [b]

(a) Two (b) One (c) Zero (d) Three

6. For any a in a group G, $(a^{-1})^{-1}$ is __________ [d]

(a) a^{-1} (b) a^2 (c) e (d) a

7. For any a, b in an abelian group, $(ab)^2$ = [a]

(a) a^2b^2 (b) ab^2 (c) a^2b (d) ab

8. For any a, b in a group, $(ab)^{-1}$ = [d]

(a) $a^{-1}\, b^{-1}$ (b) ba^{-1} (c) ab (d) $b^{-1}a^{-1}$

9. If $G = \langle a \rangle$ is a finite cyclic group of order n, then, [d]

(a) $\langle a' \rangle = \langle a^{n-1} \rangle$ (b) $\langle a' \rangle = \langle a^{gcd(n,x)} \rangle$

(c) $\langle a' \rangle \subseteq \langle a^s \rangle$ if r is a multiple of s mod n (d) All

10. Let H be a subgroup of G then the identity of H is _________ [a]

(a) Same as that of G (b) Not the identity in G (c) Not in G (d) All of the above

11. The inverse of the permutation $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 1 & 2 & 5 & 4 \end{pmatrix}$ is ____________ [b]

(a) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 5 & 4 & 1 \end{pmatrix}$ (b) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 5 & 4 \end{pmatrix}$ (c) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 4\ 51 & 3 & 1 & 2 & \end{pmatrix}$ (d) None of these

12. The permutation $\begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{pmatrix}$ is an ___________ [b]

(a) Even permutation (b) Odd permutation (c) Both (a) and (b) (d) None of these

13. If H is a subgroup of G, m is the distinct right cosets, of H in G, n is the number of distinct left cosets of H in G, then [c]

(a) m=2n (b) n=2m (c) m=n (d) None of these

14. If ∅ is a hormorphism from a group G into a group G, then for any g in G, ∅ (g^{-1}) is [a]

(a) $(\emptyset(g))^{-1}$ (b) ∅(g) (c) $((\emptyset(g))^{-1})^{-1}$ (d) $\emptyset(g^{-1})^2$

15. To define the quotient group G/N of a group G __________ [c]

(a) N must be an abelian subgroup of G (b) It is enough if N is a subgroup G

(c) N must be a normal subgroup o f G (d) None of these

16. If p,q be any two elements of a group G, then the equations px = q and yp = q have in G [b]

(a) No solution (b) An unique solution (c) Many solutions (d) Two solutions

17. If a binary operation * is defined on a set S by a * b = a ∀ a,b ∈ S then * is [b]

(a) Commutative (b) Associative (c) Not associative (d) Inverse

18. The number of right cosets of any subgroup of a finite group a is [b]

(a) Greater than the number of left cosets (b) Equal to the number of left cosets

(c) Less than the number of left cosets (d) Less than or equal to the number of left cosets

19. Let G be a group of order n and a ∈ G. Then _________ [b]

(a) $a = e^n$ (b) $a^n = e$ (c) a = e (d) None

20. Q under addition is not isomorphic to ________ [c]

(a) Q under multiplication (b) Q* under addition

(c) Q* under multiplication (d) None

II. Fill in the Blanks

1. If a is a generator of a cyclic group G, then $\underline{a^{-1}}$ is also a generator of G.
2. A cyclic group of order 'n' has <u>∅(n)(=number of positive integers less than and relatively prime to n)</u> Generators.
3. If H, K are normal subgroups of group G such that $H \cap K = (e)$ and G = HK. Then $\underline{G \cong H \oplus K}$
4. The normalizer N (a) of a in group G is <u>{x ∈G/ax = xa}</u>
5. If the commutator of every two elements of G is the identity element of G, then G is <u>an abelian</u> group.
6. The number of generators of an infinite cyclic group is <u>2</u>
7. The total number of subgroups of a group of order 13 is <u>2</u>
8. If a finite group of order n contains an element of order n, then the group must be <u>cycle</u>
9. The intersection of two subgroups of a group is <u>a sub group of the group</u>
10. The centre C of a group G is the set C = <u>{c ∈ G/cx = xc ∀ x ∈ G}</u>
11. Product of two odd permutations is an <u>even</u> permutation.
12. <u>Sn</u> Indicates the group of all permutations on a finite set with n elements.
13. $f:G_1 \to G_2$ and $g:G_2 \to G_3$ be isomorphisms then $\underline{g \text{ of } :G_1 \to G_3}$ of is an isomorphism.
14. G is the group of symmetries of the <u>rectangle</u>
15. If $G_1 \cong G_2$ and $H_1 \cong H_2$ then $\underline{G_1 X H_1 \cong G_2 X H_2}$
16. If G is any group, a is any element of G, then $f(x) = a x a^{-1}$ is <u>automorphism</u> of G
17 The centre of an abelian group G is <u>G</u>
18. If G is commutative and G* and G^p are same then it is called <u>regular representation</u> of G.
19. The order of -1 in the multiplicative group (-1, 1, i, -i) is <u>2</u>
20. The number of distinct left or right cosets of a subgroup H in a finite group G is called as <u>index</u> of H.

Short Answers.

1. What is a Group?
2. Define order of an element of a group?
3. Find the order of a^6 if $|a|=15$?
4. Define center of a group?
5. What is the group of 4^{th} root of unity?

6. Define Even permutation and odd permutation?
7. List any two properties of cosets?
8. Find the index of a subgroup H with $|G|$=12, $|H|$=6 ?
9. State Lagrange's theorem?
10. State Cayley's theorem?