**Department of Mathematics**

M.Sc. (I Year/I Sem) Question Bank

**Paper-IV Subject : Elementary Number Theory (104)**

**Unit – III**

1. a ≡ b (mod m) is defined as [ ]

A) m | (a+b)

B) m | (a-b)

C) m | ab

D) m (a-b)

E) None of these

2. If ‘a’ is even then [ ]

A) a 0(mod 2)

B) a ≡ 1 (mod 2)

C) a ≡ 0 (mod 2)

D) a ≡ a (mod 2)

E) None of these

3. If a is odd then [ ]

A) a ≡ 0 (mod 2)

B) a 1 (mod 2)

C) a ≡ 2 (mod 2)

D) a ≡ 1 (mod 2)

E) None of these

4. a ≡ b (mod m) and b ≡ a (mod m) is called [ ]

A) Reflexive relation

B) Symmetric Relation

C) Transitive Relation

D) Equivalence Relation

E) All of these

5. a ≡ b (mod m) and b ≡ c (mod m) then which of the following is true [ ]

A) a ≡ c (mod m)

B) ac ≡ 0 (mod m)

C) ab ≡ 0 (mod m)

D) a c (mod m)

E) None of these

6. If a ≡ b (mod m) and α ≡ β (mod m) then [ ]

A) ax + αy ≡ b+β (mod m)

B) ax + αy ≡ bx+βy (mod m), x, y ∈ Z

C) aα bβ (mod m)

D) a + α ≡ bx + βy (mod m)

E) None of these

7. If m | a-b if and only if [ ]

A) a – b ≡ 0 (mod m)

B) a – b ≡ 1 (mod m)

C) a – b 0 (mod m)

D) a b (mod m)

E) None of these

8. If c > 0 then a ≡ b (mod m) if and only if [ ]

A) ac ≡ bc (mod m)

B) ac bc (mod mc)

C) ac ≡ bc (mod mc)

D) a ≡ b (mod mc)

E) None of these

9. Assume a ≡ b (mod m). If d | m and d | a then [ ]

A) d | b

B) d b

C) a | d

D) b | d

E) None of these

10. If a ≡ b (mod m) and d | m then [ ]

A) b ≡ a (mod d)

B) a b (mod d)

C) a ≡ b (mod md)

D) a ≡ b (mod d)

E) None of these

11. If a ≡ b (mod m) then which of the following is true [ ]

A) [a, m] = [b, m]

B) (a, m) = (b, m)

C) [a, m] = (a, b)

D) (a, m) ≠ (b, m)

E) None of these

12. 3 400 ≡ x (mod 10) then x = \_\_\_\_\_\_\_\_\_ [ ]

A) 0

B) 1

C) 2

D) 3

E) All of these

13. 2 50 ≡ x (mod 7) then x \_\_\_\_\_\_\_\_ [ ]

A) 1

B) 2

C) 3

D) 4

E) None of these

14. Find the reminder of [ ]

A) 1

B) 3

C) 5

D) 6

E) None of these

15. If m = 6 then CRS (mod 6) [ ]

A) {0, 1, 2, 3}

B) {0, 1, 2, 3, 4}

C) {0, 1, 2, 3, 4, 5}

D) {2, 4, 6}

E) None of these

16. If m = 6 then RRS (mod 6)= \_\_\_\_\_\_ [ ]

A) {0, 1, 2, 3, 4, 5}

B) {7, 9}

C) {2, 3, 6}

D) {7, 11}

E) None of these

17. The quadratic congruence x2 ≡ 1 (mod 8) has how many solutions? [ ]

A) 2

B) 4

C) 6

D) 8

E) None of these

18. Find the solutions of x2 – 1 ≡ 0 (mod 6)

A) 1, 2

B) 2, 3

C) 1, 4

D) 1, 5

E) None of these

19. x2 + 1 ≡ 0 (mod 8) has how many solutions? [ ]

A) Two solutions

B) Only one solution

C) Eight solutions

D) No solutions

E) None of these

20. If ‘P’ is a prime then according to Wilson’s theorem (P-1)! ≡ [ ]

A) 1 (mod P)

B) -1 (mod P)

C) 0 (mod P)

D) 2 (mod P)

E) None of these

21. 25x ≡ 15 (mod 29) then x = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ [ ]

A) 15

B) 16

C) 17

D) 18

E) None of these

22. Let ‘P’ is a prime & f(x) = c0 + c1x + c2x2 + …….. + cnxn is a polynomial

of degree ‘n’ with integer coefficients such that cn 0 (mod P) then the

polynomial congruence f(x) ≡ 0 (mod P) has how many solutions [ ]

A) Unique solution

B) At least n solutions

C) At most ‘n’ solutions

D) Infinite solutions

E) None of these

23. If (a, m) = 1, the solution of linear congruence ax ≡ b (mod m) is given

by x ≡ [ ]

A)

B) a

C) ab (mod m)

D)

E) All of these

24. Assume that (a, m) = d then the linear congruence ax ≡ b (mod m) has

a solution if and only if [ ]

A) b | d

B) d | b

C) d | m

D) a | m

E) None of these

25. If a ≡ b (mod m) and α ≡ β (mod m) then [ ]

A) a + α ≡ b + β (mod m)

B) a - α ≡ b - β (mod m)

C) aα ≡ bβ (mod m)

D) aα + bβ ≡ 1 (mod m)

E) All of these

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**UNIT – III ANSWER KEY**

|  |  |  |
| --- | --- | --- |
| 1 | B | m | (a-b) |
| 2 | C | a ≡ 0 (mod 2) |
| 3 | D | a ≡ 1 (mod 2) |
| 4 | B | Symmetric Relation |
| 5 | A | a ≡ c (mod m) |
| 6 | B | ax + αy ≡ bx+βy (mod m), x, y ∈ Z |
| 7 | A | a – b ≡ 0 (mod m) |
| 8 | C | ac ≡ bc (mod mc) |
| 9 | A | d | b |
| 10 | D | a ≡ b (mod d) |
| 11 | B | (a, m) = (b, m) |
| 12 | B | 1 |
| 13 | D | 4 |
| 14 | D | 6 |
| 15 | C | {0, 1, 2, 3, 4, 5} |
| 16 | D | {7, 11} |
| 17 | B | 4 |
| 18 | D | 1, 5 |
| 19 | D | No solution |
| 20 | B | -1 (mod P) |
| 21 | D | 18 |
| 22 | C | At most ‘n’ solutions |
| 23 | A |  |
| 24 | B | d | b |
| 25 | C | aα ≡ bβ (mod m) |

**UNIT – IV**

1. If (a, m) = 1 then according to Euler Format we have [ ]

A)

B)

C)

D)

E) None of these

2. Let P is any odd prime, then every residue system modulo P

contains exactly How many Quadratic residue modulo P [ ]

A)

B)

C)

D)

E) None of these

3. If m ≡ n (mod p) then which of the following is true [ ]

A)

B)

C)

D) ; ;

E) None of these

4. Let p is an odd prime, if p n then the legender symbol is defined

as or (n|p) [ ]

A) 1 if n R p

B) -1 if n p

C) -1 if n R p

D) 1 if n R p and -1 if n p

E) None of these

5. Let p be an odd prime then for all ‘x’ we have (n | p) or ≡ \_\_ [ ]

A)

B)

C)

D)

E) All of these

6. If p is an odd prime and p n then \_\_\_\_\_ [ ]

A) 1 (mod p )

B) -1 (mod p)

C) ± 1 (mod p)

D) ± 2 (mod p)

E) None of these

7. For every odd prime p, we have ( 2 | p) = 1 if \_\_\_\_\_ [ ]

A) p ≡ 1 (mod 8)

B) p ≡ -1 (mod 8)

C) p ≡ ± 1 (mod 8)

D) p ≡ ± 1 (mod 2)

E) None of these

8. For every odd prime ‘P’, we have if [ ]

A) P ≡ ± 1 (mod 8)

B) P ≡ ± 2 (mod 8)

C) P ≡ ± 4 (mod 8)

D) P ≡ ± 3 (mod 8)

E) All of these

9. If ‘P’ is prime and P a then \_\_\_\_\_ [ ]

A) 1 (mod P)

B) -1 (mod P)

C) 2 (mod P)

D) -2 (mod P)

E) None of these

10. For any integer ‘a’ any prime P then ap ≡ [ ]

A) 1 (mod P)

B) -1 (mod P)

C) P (mod P)

D) -2 (mod P)

E) None of these

11. If p and q are distinct odd primes then = \_\_\_\_ [ ]

A)

B)

C)

D)

E) None of these

12. Let p be an odd prime and n be an integer with (n, p) = 1 Let ‘m’ be

the number of least positive residue of the integers

n, 2n, 3n, ……… [ ]

A)

B)

C)

D)

E) None of these

13. Determine 210 is a quadratic residue mod 383 [ ]

A) 0 B) 1

C) -1 D) 2

E) None of these

14. Let p be an odd prime and n be an integer with (n, p) = 1

Let m be the number of least positive residue of the integers

n, 2n, 3n, …… () n. then m = \_\_\_\_ [ ]

A)

B)

C)

D)

E) None of these

15. Assume n 0 (mod p) and consider the least positive residues

(mod p) of the following multiples of n : n, 2n, 3n ….. () n.

If m denotes the number of these residues with exceed ,then (n | p)= \_\_\_\_[ ]

A) (1) m

B) (-1) m

C) (2) m

D) (-2) m

E) None of these

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**UNIT – IV ANSWER KEY**

|  |  |  |
| --- | --- | --- |
| 1 | A |  |
| 2 | D |  |
| 3 | D | ; ; |
| 4 | D | 1 if n R p and -1 if n p |
| 5 | B |  |
| 6 | C | ± 1 (mod p) |
| 7 | C | p ≡ ± 1 (mod 8) |
| 8 | D | P ≡ ± 3 (mod 8) |
| 9 | A | 1 (mod P) |
| 10 | D | -2 (mod P) |
| 11 | D |  |
| 12 | C |  |
| 13 | B | 1 |
| 14 | C |  |
| 15 | B | (-1) m |