**Department of Mathematics**

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

**Paper – V Subject: Mathematical Methods (105)**

**Unit – III**

1. The General Bassels equation is [ ]

A) x2y″ + xy′ + xy = 0

B) x2 y′ + (x2 - n2)y = 0

C) x2y″ + 2xy′ + xy = 0

D) x2y″ + xy′ + (x2-n2)y = 0

E) x2y″ + xy′ + 2n2y = 0

2. when n is a [ ]

A) Positive Integer

B) Negative Integer

C) Both Positive Integer & Negative Integer

D) Constant

E) None of these

3. = ∞ if n = \_\_\_\_\_\_\_\_\_ [ ]

A) 0

B) Positive Integer

C) Negative Integer

D) 0 & Positive Integer

E) 0 & Negative Integer

4. if [ ]

A) n > 0

B) n < 0

C) n ≥ 0

D) n ≤ 0

E) n = 0

5. + =\_\_\_\_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E)

6. = \_\_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E) (x)

7. = \_\_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E)

8. Expansion of (1-x)-2 is [ ]

A) 1+2x+3x2+……..

B) 1-2x+3x2- ………

C) 1+2+3

D) 1-2+3

E) 1+2x+(3x)2+ ……..

9. = \_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E)

10. = \_\_\_\_\_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E)

11. is called the generating function for [ ]

A) B)

C) D)

E) All of these

12. [ ]

A)

B)

C)

D)

E)

13. are solutions of [ ]

A) Bessel’s equation

B) Legendre’s equation

C) Lequerre equation

D) Her mite equation

E) None of these

14. All roots of are [ ]

A) Real

B) Imaginary

C) Symmetric

D) Non-Symmetric

E) None of these

15. The recurrence relation = \_\_\_\_\_\_ [ ]

A) -

B) +

C) -

D) –

E) None of these

16. + = \_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E)

17. = \_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E)

18. J0(x) = satisfies Bessel’s equation in which [ ]

A) n = 1

B) n=0

C) n = ∞

D) n = - ∞

E) None of these

19. Trigonometric expansion of “Sinx” involving Bessel’s function [ ]

A) 2J1-2J3+2J5 - ……….

B) J0-2J4+2J6 - ……….

C) J0-2Sin.J1+2Sin3.J3 - ……….

D) J0-2Cos2.J2+2Cos4.J4 - ……….

E) None of these

20. Jn(-x) = \_\_\_\_\_ [ ]

A) Jn+1(x)

B)

C)

D)

E) None of these

21. The General form of Legendre’s equation is [ ]

A)

B)

C)

D)

E) None of these

22. is called the generating function for Legendre

polynomials [ ]

A) Jn(x)

B) Ln(x)

C) Hn(x)

D) Pn(x)

E) None

23. Legendre’s polynomial P2n+1(0) = \_\_\_\_\_\_ [ ]

A) 1

B) 2

C) 0

D)

E)

24. Pn(0) = 0 if n is [ ]

A) Prime

B) Even

C) Odd

D) Relative Prime

E) Integer

25. = \_\_\_\_\_\_\_, |x| ≤ 1, |z| < 1 [ ]

A)

B)

C)

D)

E) None

26. Pn(-x) = \_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E)

27. Orthogonal properties of Legendre’s polynomial [ ]

A) {

B) {

C) {

D) {

E) None of these

28. Recurrence relation nPn = \_\_\_\_\_ [ ]

A)

B)

C)

D)

E) None of these

29. (2n+1) Pn = \_\_\_\_\_\_ [ ]

A) P′n+1

B) P′n-1

C) P′n+1- P′n-1

D) P′n+1+ P′n-1

E) None of these

30. Expansion of ( [ ]

A)

B)

C)

D)

E) None of these

31. P′n(1) = \_\_\_\_\_ [ ]

A) n (n+1)

B)

C)

D)

E)

32. P′n(-1) = \_\_\_\_\_ [ ]

A)

B)

C)

D)

E) None of these

33. Pn (1) = \_\_\_\_ [ ]

A) 0

B)

C)

D) 1

E)

34. -x [ ]

A)

B)

C) (n+1)Pn

D) (2n+1) Pn

E) n Pn+1

35. [ ]

A)

B)

C)

D)

E)

36. How many recurrence relations in Jn(x) = \_\_\_\_ [ ]

A) Four

B) Five

C) Seven

D) Six

E) Three

37. \_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E)

38. [ ]

A) (n+1)

B) n

C) n(n+1)

D) n(n-1)

E) n2+1

39. [ ]

A) m ≥ n

B) m ≤ n

C) m = n

D) m ≠ n

E) None of these

40. [ ]

A) n ≠ 0

B) n = 0

C) n ≥ 1

D) n ≤ 1

E) n = 1

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**UNIT – III ANSWER KEY**

|  |  |  |
| --- | --- | --- |
| 1 | D | x2y″ + xy′ + (x2-n2)y = 0 |
| 2 | A | Positive Integer |
| 3 | E | 0 & Negative Integer |
| 4 | C | n ≥ 0 |
| 5 | B |  |
| 6 | C |  |
| 7 | B |  |
| 8 | A | 1+2x+3x2+…….. |
| 9 | B |  |
| 10 | B |  |
| 11 | A |  |
| 12 | A |  |
| 13 | A | Bessel’s equation |
| 14 | A | Real |
| 15 | A | - |
| 16 | D |  |
| 17 | C |  |
| 18 | B | n=0 |
| 19 | A | 2J1-2J3+2J5 - ………. |
| 20 | C |  |
| 21 | D |  |
| 22 | D | Pn(x) |
| 23 | C | 0 |
| 24 | C | Odd |
| 25 | B |  |
| 26 | A |  |
| 27 | A | { |
| 28 | D |  |
| 29 | C | P′n+1- P′n-1 |
| 30 | A |  |
| 31 | B |  |
| 32 | B |  |
| 33 | D | 1 |
| 34 | A |  |
| 35 | B |  |
| 36 | D | Six |
| 37 | B |  |
| 38 | C | n(n+1) |
| 39 | D | m ≠ n |
| 40 | B | n = 0 |

**Unit – Iv (Paper v)**

1. The General Her mite’s equation is [ ]

A) y″-2xy′+2ny=0

B) y‴-2x2y″+2n y′=0

C) y″-2x2y′+2ny=0

D) y″-2xy′+2n(n+1)y=0

E) None

2. Her mite Polynomial of order n is defined by [ ]

A)

B)

C)

D)

E) None of these

3. The Generating function for Her mite polynomial is [ ]

A)

B)

C)

D)

E) All the these

4. The value of H1(x) = \_\_\_\_\_ [ ]

A) 1

B) 2x

C) 2x2

D) 4x2-2

E) 0

5. H2n+1 (0) = \_\_\_\_\_\_\_\_ [ ]

A) 0

B) 1

C) -1

D)

E) 2x

6. The recurrence relation H′n(x)=2nHn-1(x) if \_\_\_\_\_\_ [ ]

A) n > 1 B) n < 1

C) n ≥ 1 D) n ≤ 1

E) n = 1

7. The value of 2xHn(x) – Hn+1(x) = \_\_\_\_\_\_ [ ]

A) H″n(x)

B) H′n(x)

C) H′n+1(x)

D) H′n-1(x)

E) None of these

8. The recurrence relation H″n(x) – 2x H′n(x)+2nHn(x)= \_\_\_\_ [ ]

A) 1

B) 0

C) 0 & 1

D)

E)

9. The recurrence relation H1(x) = \_\_\_\_ [ ]

A) 2H0(x)

B) xH0(x)

C) 2xH0(x)

D) 0

E) None of these

10. The recurrence relation of Hn+1(x) = [ ]

A) 2xHn(x)

B) 2nHn-1(x)

C) 2xHn(x)-2nHn-1(x)

D) 2xHn(x)+2nHn-1(x)

E) None of these

11. Orthogonal property of Her mite polynomial [ ]

A) m = n

B) m ≥ n

C) m ≤ n

D) m ≠ n

E) None of these

12. [ ]

A)

B)

C)

D)

E) 0

13. Her mite polynomials are orthogonal over (-∞, ∞) with respect to the

weight function \_\_\_\_ [ ]

A)

B)

C)

D) Exp

E) None of these

14. If m < n, = \_\_\_\_\_ [ ]

A)

B)

**C)**

**D)**

E)

15. [ ]

A)

B)

C)

D)

E) None of these

16. Value of = \_\_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E) (2n)!

17. Her mite’s solution is denoted by \_\_\_\_\_\_ [ ]

A) Pn (x)

B) Qn (x)

C) Hn (x)

D) Ln (x)

E) Jn (x)

18. The value of H4(x) is \_\_\_\_\_\_\_ [ ]

A) 4x2 – 2

B) 8x3 – 12x

C) 16x4 – 48x2 – 12

D) 16x4 – 48x2+ 12

E) 8x3 + 12x

19. The value of H3(x) is \_\_\_\_\_ [ ]

A) 2x

B) 4x2 – 2

C) 16x4 – 48x2 + 12

D) 8x3 – 12x

E) None of these

20. Hn (x) is a solution of Her mite’s differential equation is [ ]  
 A) H″n(x) – 2xH′n(x) + 2nHn(x) = 0

B) H″n(x) + 2xH′n(x) – 2nHn(x) = 0

C) H″n(x) – 2xH′n(x) – 2nHn(x) = 0

D) H″n(x) + 2xH′n(x) + 2nHn(x) = 0

E) None of these

21. Laguerre’s equation of order n is [ ]

A)

B)

C)

D)

E) None of these

22. Laguerre polynomial of order n is defined by \_\_\_\_\_\_\_\_ [ ]

A) Ln (x)

B) Jn (x)

C) J–n (x)

D) Pn (x)

E) Hn (x)

23. Generating function for Laguerre polynomial =\_\_\_\_ [ ]

A)

B)

C)

D)

E) None of these

24. Alternative expression for the Laguerre polynomial is [ ]

A)

B)

C)

D)

E) None of these

25. Laguerre polynomial L1(x) = \_\_\_\_\_ [ ] A) 1

B) x

C) 1 + x

D) 1 – x

E) x2 + 1

26. The value of L3(x) = \_\_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E) None of these

27. The recurrence relation xL′n (x) = \_\_\_\_ [ ]

A) nLn(x) – nLn-1 (x)

B) nLn(x) + nLn+1 (x)

C) nLn(x) + nLn-1 (x)

D) nLn-1(x)

E) (2n+1-x) Ln(x)

28. The recurrence relation L′n(x) = \_\_\_\_ [ ]

A)

B)

C)

D) nLn-1(x)

E) None of these

29. The recurrence relation nLn(x) – nLn-1(x)= \_\_\_ [ ]

A) L′n (x)

B) nL′n(x)

C) xL′n(x)

D) Ln+1(x)

E) L′n+1(x)

30. L′n (0) = \_\_\_\_\_\_\_ [ ]

A) 0

B) 1

C) n!

D) -n

E)

31. (0) = \_\_\_\_\_\_ [ ]

A)

B)

C)

D)

E) None of these

32. Ln(0) = \_\_\_\_\_\_ [ ]

A) 1

B) n!

C) (n-1)!

D) (n+1)!

E) (-1)n n!

33. The value of [ ]

A) 1

B) 0

C) n!

D) -n

E) None of these

34. The value of [ ]

A) 0

B) 1

C) n!

D) -n

E) None of these

35. Ln(x) satisfies Laguerre’s equation of order n is [ ]

A) xL″n(x) + (1+x) L′n(x) + nLn(x) = 0

B) xL″n(x) + (1-x) L′n(x) + nLn(x) = 0

C) xL″n(x) - (1-x) L′n(x) + nLn(x) = 0

D) xL″n(x) + (1-x) L′n(x) - nLn(x) = 0

E) None of these

36. How many recurrence relations in Laguerre polynomials [ ]

A) Two

B) Four

C) Three

D) Five

E) Six

37. is called Generating function for \_\_\_\_\_ [ ]

A) Laguerre Polynomial

B) Her mite’s polynomial

C) Legendre’s Polynomial

D) Bessel’s polynomial

E) All of these

38. The value of 0! = \_\_\_\_\_\_\_\_\_\_ [ ]

A)

B) 0

C) 1

D) -

E) None of these

39. In Her mite’s polynomial, the recurrence relations are [ ]

A) 4

B) 2

C) 5

D) 6

E) 3

40. Alternative expressions for the Her mite polynomial Hn(x) = \_\_\_\_ [ ]

A)

B)

C)

D)

E)

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**UNIT – IV (ANSWER KEY)**

|  |  |  |
| --- | --- | --- |
| 1 | A | y″-2xy′+2ny=0 |
| 2 | C |  |
| 3 | A |  |
| 4 | B | 2x |
| 5 | A | 0 |
| 6 | C | n ≥ 1 |
| 7 | B | H′n(x) |
| 8 | B | 0 |
| 9 | C | 2xH0(x) |
| 10 | C | 2xHn(x)-2nHn-1(x) |
| 11 | D | m ≠ n |
| 12 | D |  |
| 13 | B |  |
| 14 | A |  |
| 15 | C |  |
| 16 | D |  |
| 17 | C | Hn (x) |
| 18 | D | 16x4 – 48x2 + 12 |
| 19 | D | 8x3 – 12x |
| 20 | A | H″n(x) – 2xH′n(x) + 2nHn(x) = 0 |
| 21 | B |  |
| 22 | A | Ln (x) |
| 23 | B |  |
| 24 | A |  |
| 25 | D | 1 – x |
| 26 | B |  |
| 27 | A | nLn(x) – nLn-1 (x) |
| 28 | A |  |
| 29 | C | xL′n(x) |
| 30 | D | -n |
| 31 | A |  |
| 32 | A | 1 |
| 33 | B | 0 |
| 34 | B | 1 |
| 35 | B | xL″n(x) + (1-x) L′n(x) + nLn(x) = 0 |
| 36 | C | Three |
| 37 | A | Laguerre Polynomial |
| 38 | C | 1 |
| 39 | A | 4 |
| 40 | A |  |