Unit 1 and 2

1) $\Delta f(x) =$

✓a) $f(x+h) - f(x)$ b) $f(x) - f(x-h)$

c) $f(x) + f(x-h)$ d) $f(x+h) + f(x)$

2) $E^3(3x^2 - 2)$

a) $3(x+h)^3$ ✓b) $3(x+3h) - 2$

c) $3(x+h)^3 - 2$ d) $3(x+3h)$

3) Δ (constant) $=$

a) 0 b) 1 c) -1 d) Not defined

4) $\Delta[f(x)g(x)] =$

✓a) $f(x)\Delta g(x) + g(x+h)\Delta f(x)$

b) $f(x)\Delta g(x)$ c) $\Delta f(x) g(x)$

d) $f(x+h)\Delta g(x+h)$

5) $\Delta\left[\frac{f(x)}{g(x)}\right] =$

a) $\frac{g(x)\Delta f(x) - f(x)\Delta g(x)}{[g(x)]^2}$

✓b) $\frac{g(x)\Delta f(x) - f(x)\Delta g(x)}{g(x)g(x+h)}$

c) $\frac{f(x+h)}{g(x+h)}$

d) None of these

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6) $E^{-n} f(x) =$

a) $f(x+nh)$ b) $\frac{1}{f(x-nh)}$

✓c) $f(x-nh)$ d) $\frac{1}{f(x+nh)}$

7) Express $x^{(3)}$ into algebraic polynomial

✓a) $x^3 - 3x^2h + 2xh^2$ b) $x^3 + 3xh + 2x^2h$

c) $x^3 + 4xh + 2xh^2$ d) None

8) Express $x^4 + x + 8$ as a factorial polynomial with $h=1$

a) $x^{(4)} + x^{(1)} + 8$ b) $x^{(4)} + 6x^{(3)} + 7x^{(2)} + 2x^{(1)}$

✓c) $x^{(4)} + 6x^{(3)} + 7x^{(2)} + 2x^{(1)} + 8$ d) None of these

9) The subscript notation of $f(x+3h) + 5f(x+2h) - 3f(x+h) - 3f(x) = 0$ is

a) $y^3_k + 5y^2_k - 3y_k - 3 = 0$

✓b) $y_{k+3} + 5y_{k+2} - 3y_{k+1} - 3y_k = 0$

c) $y_{x+3h} + 5y_{x+2h} - 3y_{x+h} - 3y_x = 0$

d) $y_{3h} + 5y_{2h} - 3y_h - 3 = 0$

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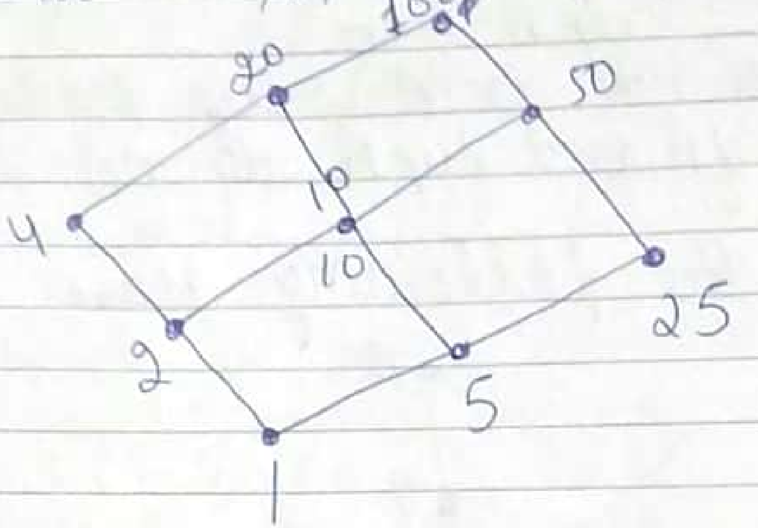
10) Draw the Hasse diagram of $(D_{100}, /)$

Sol. $D_{100} = \{1, 2, 4, 5, 10, 20, 25, 50, 100\}$



11) Which of the following is not a lattice?

a) D_n ~~(b)~~ b) $P = \{2, 3, 4, 6\}$ under divisibility

c) $(P(X), \subseteq)$ d) $a \leq b$

12) If $O(A) = n$

a) <u>No. of Reflexive Relation</u> $\rightarrow 2^{(n^2 - n)}$

b) <u>No. of Symmetric Relations</u> $\rightarrow 2^{\frac{n(n+1)}{2}}$

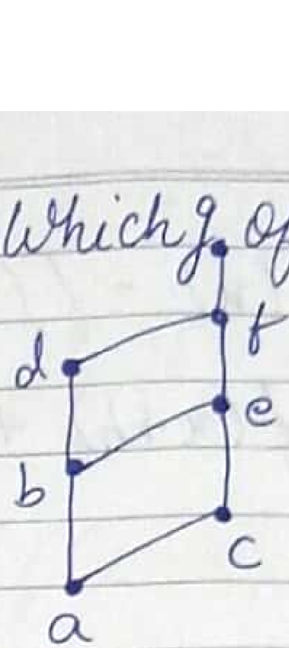
c) <u>No. of both symmetric and reflexive relations</u> $\rightarrow 2^{\frac{n(n-1)}{2}}$

d) <u>No. of anti-symmetric relations</u> $\rightarrow$

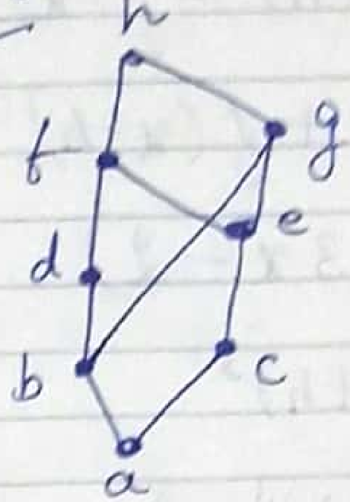
$2^n \, 3^{\frac{n(n-1)}{2}}$

13) Which of the following is not a lattice?

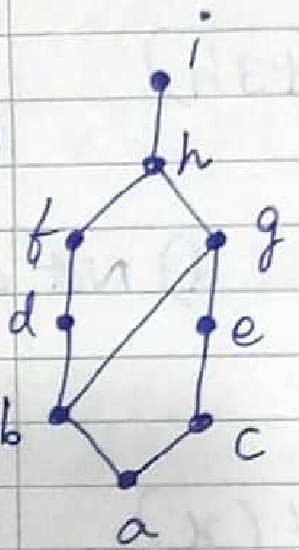
a)



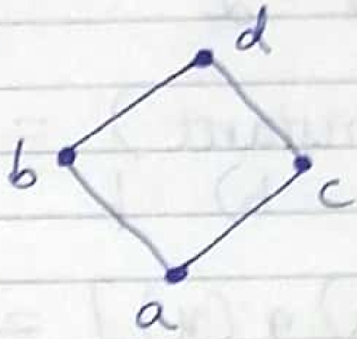
b)



c)



d)



14) A graphical representation of a POSET where loops and all edges resulting from the transitive property are not shown is known as

a) Diagraphs

b) Hasse diagram

c) Adjacency form

d) None

Unit - 3

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1) If $A = \{a, b, c\}$ then $n(A \times A) =$

a) 6 b) 8 ✓c) 9 d) 3

2) If $A = \{1, 2\}$; $B = \{3, 4\}$ then the total number of relations from A to B =

a) 2^2 ✓b) 2^4 c) 4^2 d) None

3) Consider the given relation R, defined on $A = \{1, 2, 3\}$ and
$R = \{(1,1), (2,2), (2,3), (3,2), (3,3)\}$
Which of the following statement is false?

a) R is reflexive b) R is symmetric
c) R is transitive ✓d) R is anti-symmetric

4) According to the Hasse diagram, if POR is $\{(a,b) : a|b\}$ on $\{1, 2, 3, 4, 6\}$ then the maximal elements =

a) 4 b) 6 ✓c) 4 and 6 d) 3

5) Consider the POSET $P = \{(m,n) : m, n \in N, m \le n\}$ then the minimal elements is

✓a) 1 b) 2 c) 0 d) 3

6) A) Let $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$
Find l.u.b of 10 and 15

✓a) 30 b) 5 c) 10 d) 15

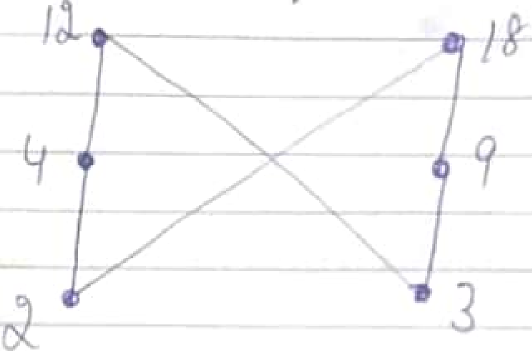
B) $\boxed{g.l.b} \rightarrow 5$

classmate

7) Let A be the set of all even integers find inf A and sup A where $A \subseteq N$

a) Inf $A = 2$; sup A does not exist
b) Inf $A = 2$; sup $A = 10$
c) Inf A does not exist ; sup $A = 10$
d) Both Inf A and sup A do not exist

8) Consider the following Hasse diagram



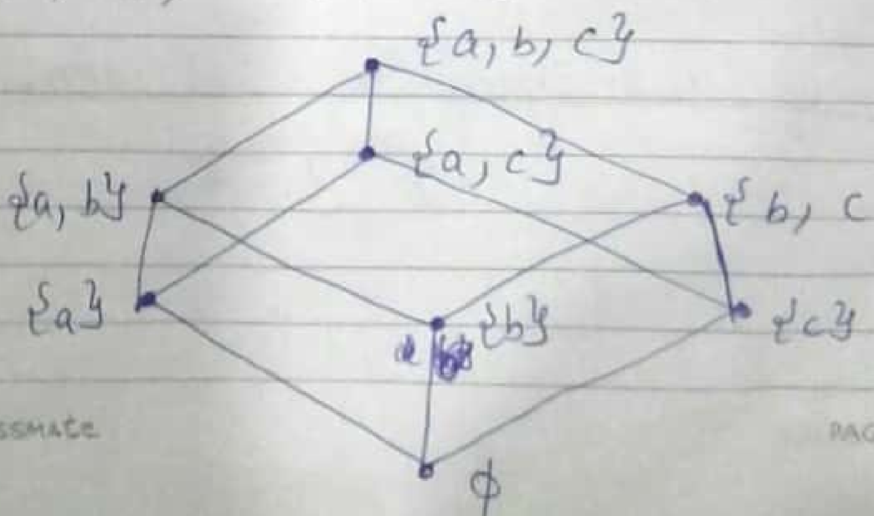
Find :-
Minimal elements $\rightarrow \{2, 3\}$

Maximal elements $\rightarrow \{12, 18\}$

It has neither greatest element nor least element.

9) Draw the Hasse diagram of $(P(A), \subseteq)$ where $A = \{a, b, c\}$

Ans $P(A) = \{\phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\}$



10 Which of the following is a non-linear difference equation?

a) $y_k y_{k+1} = y^2_{k-1}$ b) $y_{k+2} + 2y_{k+1} = 0$

c) $y_{k+3} + 3y_{k+2} - 2y_{k+1} - 2y_k = 0$ d) None

11 If the roots of any difference equation are 3 and 4 then the complementary function is written as

a) $y_k = c_1 e^{3k} + c_2 e^{4k}$

b) $y_k = c_1 (3)^k + c_2 (4)^k$

c) $y_k = c_1 3k + c_2 4k$ d) $y_k = c_1 (3^k + 4^k)$

12 Which of the following set of functions are linearly independent?

a) $2k, 2k+1, 2k+2$

b) $2^k, 3^k, 5^k$

c) $2^k, 4^k, 2^{k+1}$ d) None

13 find the solution of
$y_{k+3} - 6y_{k+2} + 11y_{k+1} - 6y_k = 0;$
$y_0 = 0; y_1 = 1; y_2 = 1$

a) $y_k = 5.2^k - 2.3^k - 3$

b) $y_k = 6.2^k - 2.3^k + 3$ c) $y_k = 4.2^k + 2.3^k + 1$

d) None

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14 Find the solution of
$y_{k+2} - 6y_{k+1} + 9y_k = 0$

✓a) $y_k = (c_1 + c_2 k)\,3^k$

b) $y_k = c_1 3^k + c_2 (-3)^k$

c) $y_k = k c_1 3^k + k^2 c_2 3^k$ d) None

15 Find the solution of $4y_{k+2} + 25y_k = 0$

✓a) $y_k = \left(\frac{5}{2}\right)^k \left[c_1 \cos \frac{k\pi}{2} + c_2 \sin \frac{k\pi}{2}\right]$

b) $y_k = c_1 5^k + c_2 2^k$

c) $y_k = \left(\frac{25}{4}\right)^k [c_1 \cos k + c_2 \sin k]$

d) $y_k = \left(\frac{5}{2}\right)^k [c_1 \cos k + c_2 \sin k]$

16 Find the particular integral of
$y_{k+2} - 2y_{k+1} + 5y_k = 2.3^k - 4.7^k$

a) $y_k = 3^k + 7^k$

b) $y_k = \frac{1}{4} \cdot 3^k + \frac{1}{10} \cdot 7^k$

✓c) $y_k = \frac{1}{4} \cdot 3^k - \frac{1}{10} \cdot 7^k$

d) $y_k = \frac{1}{10} \cdot 3^k + \frac{1}{4} \cdot 7^k$

17 The complete solution of $y_{k+2} - 4y_{k+1} + 4y_k = 2^k$ is

a) $y_k = c_1(2)^k + c_2(-2)^k + 4 \cdot 2^k$

✓b) $y_k = (c_1 + c_2 k)2^k + \frac{k(k-1)2^k}{8}$

c) $y_k = (c_1 + c_2 k)2^k + k(k-1)2^k$

d) None

18 Find $\frac{1}{E^2 - 6E + 8}(3k^2 + 2)$

a) $k^2 + 8k + 44$

b) $k^2 + 2k + 33$

✓c) $k^2 + \frac{8}{3}k + \frac{44}{9}$

d) $k^2 + \frac{7}{3}k - 44$

19 According to the method of undetermined coefficients, what will be the trial solution of $y_{k+3} - 3y_{k+2} + 3y_{k+1} - y_k = 2k$

✓a) $A_0 k^3 + A_1 k^4$

b) $A_0 + A_1 k$

c) $A_0 k + A_1 k^2$

d) $A_0 k^2 + A_1 k^4$

20 By the method of undetermined coefficients, if the right hand side of any difference equation is $\beta^k \sin \alpha k$ then the trial solution is

a) $A_1 \cos \alpha k + A_2 \sin \alpha k$

✓b) $\beta^k (A_1 \cos \alpha k + A_2 \sin \alpha k)$

c) $A\beta^k (A_1 \cos \alpha k + A_2 \sin \alpha k)$

d) None

21) By the method of variation of parameters, what will be the simultaneous equations for ΔK_1 and ΔK_2 in

$$y_{k+2} - 4y_{k+1} + 3y_k = 6^k$$

Sol. $(E^2 - 4E + 3)y_k = 6^k$

$$E^2 - 4E + 3 = 0$$

$$E^2 - 3E - E + 3 = 0$$

$$E(E-3) - 1(E-3) = 0$$

$$E = 1, 3$$

C.F. $y_k = c_1(1)^k + c_2(3)^k$

Replace c_1 & c_2 by K_1 & K_2

$$y_k = K_1(1)^k + K_2(3)^k$$

$\therefore$ Simultaneous eqs. are

Ans
$$\boxed{\begin{aligned} 1^{k+1}\Delta K_1 + 3^{k+1}\Delta K_2 &= 0 \\ \Delta(1)^{k+1}\Delta K_2 + \Delta(3^{k+1})\Delta K_2 &= 6^k \end{aligned}}$$

where $\Delta(1)^{k+1} = 0$

and $\Delta(3^{k+1}) = 3^{k+2} - 3^{k+1}$

$$= 3^{k+1}(3-1) = 2 \cdot 3^{k+1}$$

22) By method of reduction of order, if $(E-2)z_k = 3^k$ then $z_k =$

a) $2^k \Delta^{-1}\left(\frac{3^k}{2^{k+1}}\right) + c_1 2^k$ ✓

b) $\Delta^{-1}\left(\frac{3^k}{2^k}\right) + c_1 2^k$

c) $\Delta^{-1}(3^k) + c_1 2^k$

d) None