



# University of Asia Pacific

## Admit Card

Final-Term Examination of Spring, 2021

Financial Clearance

PAID

Registration No : 18101064

Student Name : Md. Sohanuzzaman Soad

Program : Bachelor of Science in Computer Science and Engineering



SI.NO.	COURSE CODE	COURSE TITLE	CR.HR.	EXAM. SCHEDULE
1	CSE 400	Project / Thesis	3.00	
2	CSE 401	Mathematics for computer Science	3.00	
3	CSE 403	Artificial Intelligence and Expert Systems	3.00	
4	CSE 404	Artificial Intelligence and Expert Systems Lab	1.50	
5	CSE 405	Operating Systems	3.00	
6	CSE 406	Operating Systems Lab	1.50	
7	CSE 407	ICTLaw, Policy and Ethics	2.00	
8	CSE 410	Software Development	1.50	
9	CSE 427	Topics of Current Interest	3.00	

Total Credit: 21.50

1. Examinees are not allowed to enter the examination hall after 30 minutes of commencement of examination for mid semester examinations and 60 minutes for semester final examinations.

2. No examinees shall be allowed to submit their answer scripts before 50% of the allocated time of examination has elapsed.

3. No examinees would be allowed to go to washroom within the first 60 minutes of final examinations.

4. No student will be allowed to carry any books, bags, extra paper or cellular phone or objectionable items/incriminating paper in the examination hall.  
Violators will be subjects to disciplinary action.

This is a system generated Admit Card. No signature is required.

# UNIVERSITY OF ASIA PACIFIC

Department of Computer Science & Engineering



## Final Examination Spring-2021

<b>Student Name</b>	: Md. Sohanuzzaman Soad
<b>Student ID</b>	: 18101064
<b>Section</b>	: B
<b>Year</b>	: 4 <sup>th</sup>
<b>Semester</b>	: 1 <sup>st</sup>
<b>Course Code</b>	: CSE 401
<b>Course Title</b>	: Mathematics for computer Science
<b>Date</b>	: 17-November-2021

Ans to the Que. No: 1(a)

$$\text{My ID} = 18909064$$

$$n = 181164$$

$$3^{181164} \bmod 181163$$

$$(181164)_{10} = (101100001110101100)_2$$

$\downarrow$   $\downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow$   $\downarrow$   
 $k=17$   $k=0$

$$a_0 = 0, \quad x = 1, \quad 3^x \bmod 181163 = 9$$

$$a_1 = 0, \quad x = 1, \quad 9^x \bmod 181163 = 81$$

$$a_2 = 1, \quad x = 1.81 \bmod 181163 = 81, \quad 81^x \bmod 181163 = 6561$$

$$a_3 = 1, \quad x = 81.6561 \bmod 181163 = 169113, \quad 6561^x \bmod 181163 = 110853$$

$$a_4 = 0, \quad x = 169113, \quad 110853^x \bmod 181163 = 33489$$

$$a_5 = 1, \quad x = 169113.33489 \bmod 181163 = 57453,$$

$$33489^x \bmod 181163 = 107961$$

$$a_6 = 0, n = 57453, 107961^{\vee} \bmod 1811643 = 29253$$

$$a_7 = 1, n = 57453, 29253 \bmod 1811643 = 14181,$$

$$29253^{\vee} \bmod 1811643 = 100437$$

$$a_8 = 1, n = 14181, 100437, \overset{\text{mod } 1811643}{100437^{\vee}} = 166893,$$

$$100437^{\vee} \bmod 1811643 = 17121$$

$$a_9 = 1, n = 166893, 17121 \bmod 1811643 = 56445,$$

$$17121^{\vee} \bmod 1811643 = 5289$$

$$a_{10} = 0, n = 56445, 5289^{\vee} \bmod 1811643 = 74265$$

$$a_{11} = 0, n = 56445, 74265^{\vee} \bmod 1811643 = 114573$$

$$a_{12} = 0, n = 56445, 114573^{\vee} \bmod 1811643 = 10053$$

$$a_{13} = 0, n = 56445, 10053^{\vee} \bmod 1811643 = 154461$$

$$a_{14} = 1, n = 56445, 154461 \bmod 1811643 = 33645$$

$$154461^{\vee} \bmod 1811643 = 169869$$

$$a_{15} = 1, n = 33645, 169869 \bmod 1811643 = 61797$$

$$169869^{\vee} \bmod 1811643 = 37500$$

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18101064

$$a_{16} = 0, n_3 = 61797, \cancel{37569} 37569^V \bmod 181169 \\ = 162201$$

$$a_{17} = 1, n = 61797, 162201 \bmod 181169 = \cancel{93405}^{35635}$$

$$162201^V \bmod 181169 = 165993$$

$$\therefore n = \cancel{93405} 35635$$

$$3^{181164} \bmod 181163 = \cancel{93405} 35635$$

Ans to the Que. No: 1(b)

$$n = 181164$$

$$f(x, y, z) = x^2 + y^2 + z^2 \rightarrow \text{obj function}$$

$$g(x, y, z) = x + 2y + 3z = 181164$$

$\hookrightarrow$  constraint

Lagrange multiplier method,

$$* f(x, y, z) = \lambda * g(x, y, z)$$

$$f(x, y, z) - \lambda * g(x, y, z) = 0$$

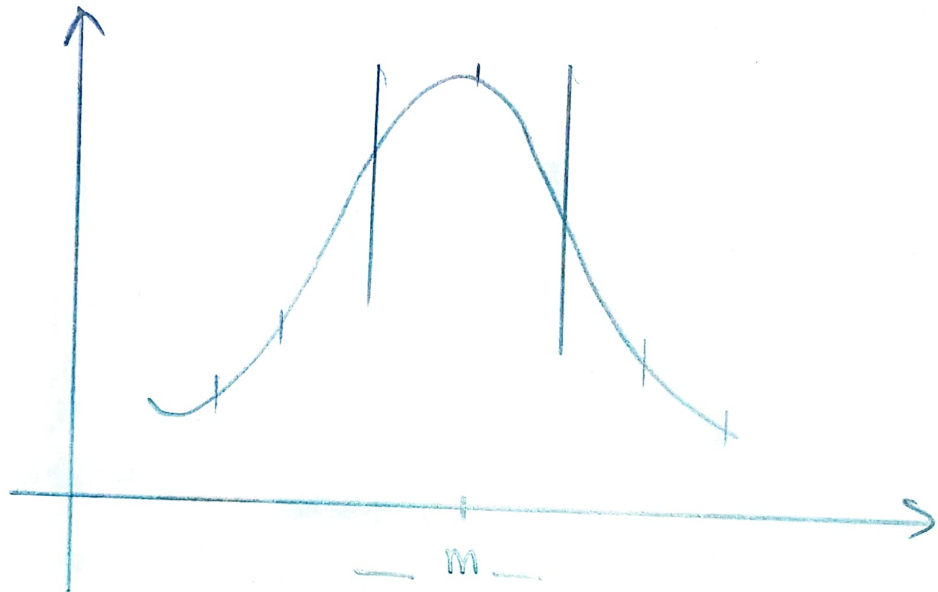
$[\lambda \text{ is slack var}]$

=



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Ans to the Que No: 2 (a)



my ID : 18101064

$$k = 4 + 1 = 5$$

$$\left(1 - \frac{1}{k^r}\right) \times 100\%$$

$$= \left(1 - \frac{1}{5^r}\right) \times 100\%$$

$$= 96\%$$

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Ans to the Que. No: 2(b)

my ID: 18101064

$$\begin{aligned}\text{Arithmetic mean} &= \frac{3 \times 1 + 2 \times 0 + 1 \times 8 + 1 \times 6 + 1 \times 4}{3 + 2 + 1 + 1 + 1} \\ &= 2.625\end{aligned}$$

Geometric Mean;

$$\begin{aligned}G &= \sqrt[8]{1 \times 8 \times 1 \times 0 \times 1 \times 0 \times 6 \times 4} \\ &= \sqrt[8]{0} \\ &= 0\end{aligned}$$



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Harmonic Mean:

$$H = \frac{8}{\frac{1}{1} + \frac{1}{8} + \frac{1}{1} + \frac{1}{0} + \frac{1}{1} + \frac{1}{0} + \frac{1}{6} + \frac{1}{4}}$$

$$= \frac{8}{2.25}$$

$$= 3.56$$

Ans to the Que, no: 2(c)

ID : 1 8 10 10 6 4

$$\begin{aligned}
 \text{i) mean} &= \frac{1+8+1+0+1+0+6+4}{8} \\
 &= \frac{21}{8} \\
 &= 2.625
 \end{aligned}$$

$$\begin{aligned}
 \text{ii) median} &= 1 \ 8 \ 10 \ \boxed{1} \ 0 \ 6 \ 4 \\
 &= \frac{0+1}{2} \\
 &= \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{iii) mode} &= \underline{1} \ \underline{8} \ \underline{10} \ 10 \ 6 \ 4 \\
 &= 1
 \end{aligned}$$

Ans to the Que. No: 3(a)

i) Dataset:

ID: 18101064

$$X = [1, 8, 1]$$

$$Y = [0, 6, 4]$$

ii) Calculate the mean of features:

$$\bar{X} = \frac{1}{3} (1 + 8 + 1) = 3.33$$

$$\bar{Y} = \frac{1}{3} (0 + 6 + 4) = 3.33$$

$$\text{cov}(X, X) =$$

iii) Covariance Matrix:

$$C = \begin{bmatrix} \text{cov}(X, X) & \text{cov}(X, Y) \\ \text{cov}(Y, X) & \text{cov}(Y, Y) \end{bmatrix}$$

$$\begin{aligned}
 \text{cov}(X, X) &= \frac{1}{N-1} \sum_{k=1}^N (X_k - \bar{X})^2 \\
 &= \frac{1}{2} \left\{ (1-3.33)^2 + (8-3.33)^2 \right. \\
 &\quad \left. + (1-3.33)^2 \right\} \\
 &= 29.95
 \end{aligned}$$

$$\begin{aligned}
 \text{cov}(X, Y) &= \frac{1}{N-1} \sum_{k=1}^N (X_k - \bar{X})(Y_k - \bar{Y}) \\
 &= \frac{1}{2} \left\{ (1-3.33)(0-3.33) + (8-3.33) \right. \\
 &\quad \left. (6-3.33) + (1-3.33)(4-3.33) \right\} \\
 &= 5.78
 \end{aligned}$$

$$\begin{aligned}
 \text{cov}(Y, X) &= \cancel{5.78} \frac{1}{n-1} \sum_{k=1}^N (Y_k - \bar{Y})(X_k - \bar{X}) \\
 &= 5.78
 \end{aligned}$$

$$\begin{aligned}
 \text{cov}(XY) &= \frac{1}{N-1} \sum_{k=1}^N (Y_k - \bar{Y})^2 \\
 &= \frac{1}{2} \{ (0 - 3.33)^2 + (6 - 3.33)^2 + (4 - 3.33)^2 \} \\
 &= 18.67
 \end{aligned}$$

(IV) Calculating the eigen values

$$\det(S - \lambda I) = 0$$

$$I_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{vmatrix} 29.95 - \lambda & 5.78 \\ 5.78 & 18.67 - \lambda \end{vmatrix} = 0$$

$$\Rightarrow (29.95 - \lambda)(18.67 - \lambda) - 5.78 \times 5.78 = 0$$

$$\Rightarrow (29.95 - \lambda)(18.67 - \lambda) - 33.40 = 0$$

$$\Rightarrow \lambda^2 - 48.62\lambda + 559.17 - 33.40 = 0$$

$$\Rightarrow \lambda^2 - 48.62\lambda + 525.77 = 0$$

$$\lambda_1 = 16.23$$

$$\lambda = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\lambda_2 = 32.39$$

① eigen vector :

$$S(\lambda I)U = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 29.95 - \lambda_1 & 5.78 \\ 5.78 & 18.67 - \lambda_1 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} (29.95 - \lambda_1)u_1 & 5.78 u_2 \\ 5.78 u_1 & (18.67 - \lambda_1)u_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\Rightarrow (29.95 - \lambda_1)u_1 = 5.78 u_2$$

$$\Rightarrow \frac{u_1}{u_2} = \frac{5.78}{29.95 - \lambda_1} = c$$



$$\| \bar{U} \| = \sqrt{(5.78)^2 + (29.95 - 16.23)^2}$$

$$= 14.88$$

Ans:

Ans to the Que: 3 (b)

Here,  $P(\text{Bull}) = 0.5$

$P(\text{Bear}) = 0.3$

$P(\text{Stagnant}) = 0.2$

Bull  $\rightarrow$  Bear  $\rightarrow$  Bull

		Bull	Bear	Stag
Transition Matrix =	Bull	0.9	0.075	0.025
	Bear	0.15	0.8	0.025
	Stag	0.25	0.05	0.5



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$$\pi = [0.5 \quad 0.3 \quad 0.2]$$

$$Q = P(\text{Bull}) * P(\text{Bull} | \text{Bear}) * P(\text{Bear} | \text{Bear}) * P(\text{Bull} | \text{Bear})$$

$$= 0.5 * 0.075 * 0.8 * 0.075$$

$$= 0.00225$$

Ans.

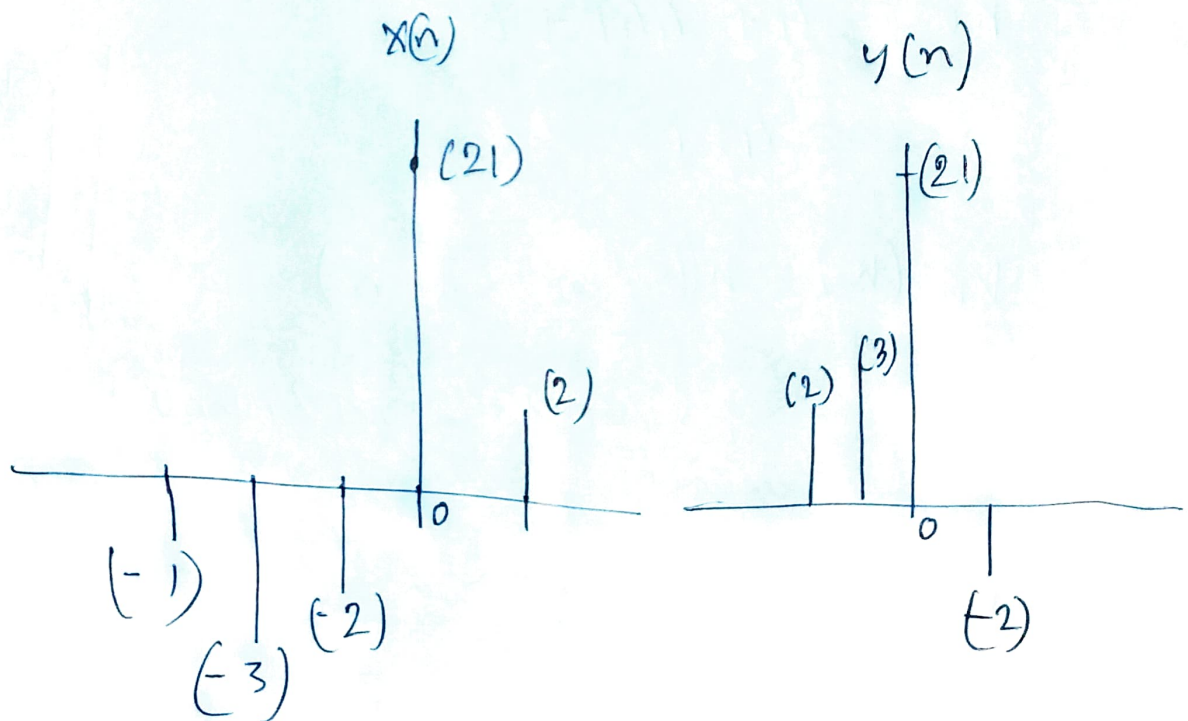
Ans to the Que, 4(a)

$$1D: 98101064$$

$$N = 1 + 8 + 14 + 0 + 14 + 0 + 6 + 4 = 21$$

$$X = [-1 \quad -3 \quad -2 \quad 21 \quad 2]$$

$$Y = [2 \quad 3 \quad 21 \quad -2]$$



Convolution signal :

$$h(n) = \sum_{k=-\infty}^{\infty} x(k) \cdot y(n-k)$$

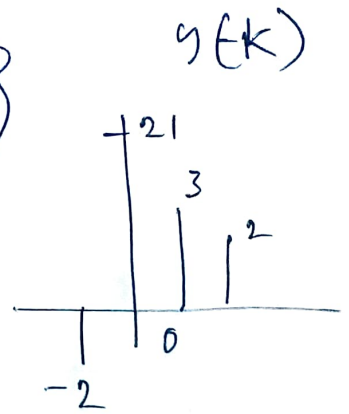
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$$v_0(k) = x(k)y(-k)$$

$$= \{-1, -3, -2, \underset{\uparrow}{21}, 2\}$$

$$\{2, \underset{\uparrow}{21}, 3, 2\}$$

$$= \{4, 44, 6, 0\}$$

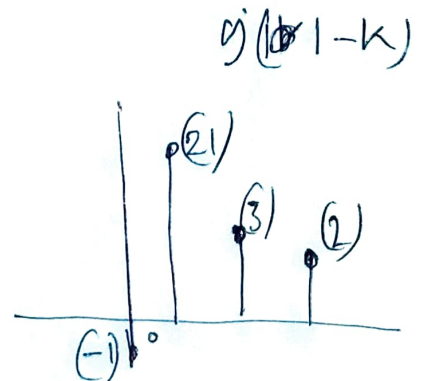


$$h_0 = 4 + 44 + 6$$

$$= 54$$

$$v_1(k) = x(k) \cdot y(1-k)$$

$$= \{0, 0, 0, -21, 42, 0, 0\}$$



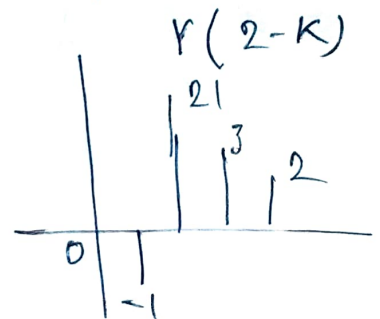
$$h_1 = -21 + 42$$

$$= 21$$

$$v_2(k) = x(k) \cdot y(2-k)$$

$$= \{-1, -3, -2, \underset{\uparrow}{21}, 2\}$$

$$\{0, \underset{\uparrow}{-1}, 21, 3, 2\}$$



$$= \{0, 0, 0, 0, -2, 0, 0\}$$

$$h_2 = -2$$

$$V_{-1}(k) = \chi(k) \cdot \chi(-1-k)$$

$$= \{-1, -3, -2, 2, 2\}$$

$$= \{-2, 2, \underset{\uparrow}{3}, 2\}$$

$$= \{0, -6, -4, 2, 6, 3, 4\}$$

$$h_{-1} = 2 \oplus 10$$

$$V_{-2}(k) = \chi(k) \cdot \chi(-2-k)$$

$$= \{2, -6, -3, 4, 2, 0\}$$

$$h_{-2} = -22$$

$$V_3 = \chi(k) \cdot \chi(3-k)$$

$$= \{-1, -3, -2, \underset{\uparrow}{2}, 2\} \quad \{ \underset{\uparrow}{0}, 0, -2, 2, 3, 2 \}$$

$$= \{0, 0, 0, 0, 0\} \quad \left| \begin{array}{l} h_3 = 0 \\ h_4 = 0 \end{array} \right.$$

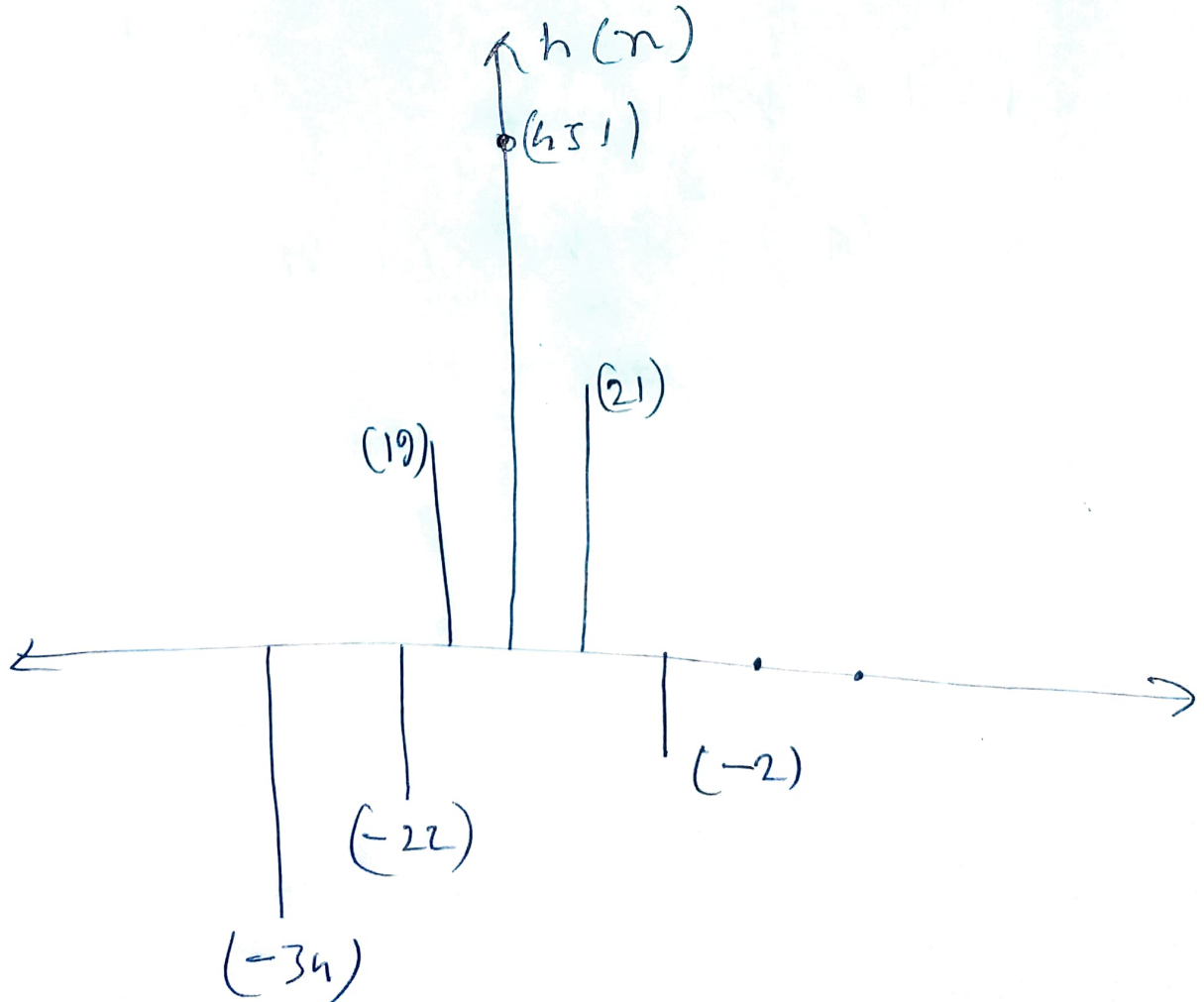
$$\begin{aligned}
 v_{-3} &= x(k) \cdot y(-3-k) \\
 &= \{0, -2, -9, -4, 0, 0\}
 \end{aligned}$$

$$h_{-3} = -34$$

Now. convolution signal :

$$h_0 = 451, h_1 = 21, h_2 = -2, h_{-1} = 19, h_{-2} = -22$$

$$h_{-2} = -22, h_3 = 0, h_4 = 0, h_{-3} = -34$$





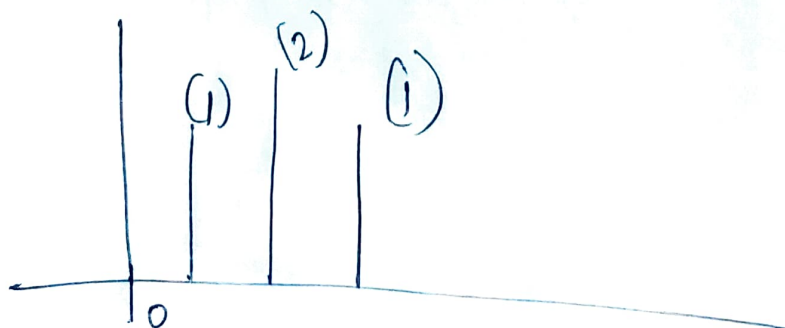
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Ans to the Q.4(b)

$$a = 0 + 1 = 1$$

$$c = 4 + 1 = 5$$

①

2 $v(n+1)$ 

⑪  $\pi(n-5)$

