Assignment – 02

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Section : 22

Course Code: CSE 221

(1) (a) Number of bits required = $(45+13+12+16+9+5) \times 8$

[ASCII → 8 bit]

$= 100 \times 8$

$= 800$ bits

(b)

characters	a	b	e	d	e	space
Fixed length code	000	001	010	011	100	110

$6 \times 8 = 48$

$+$

$6 \times 3 = 18$

$= 66$

(c) By using fixed length code:

We can save $= (45+13+12+16+9+5) \times 3 + 66$

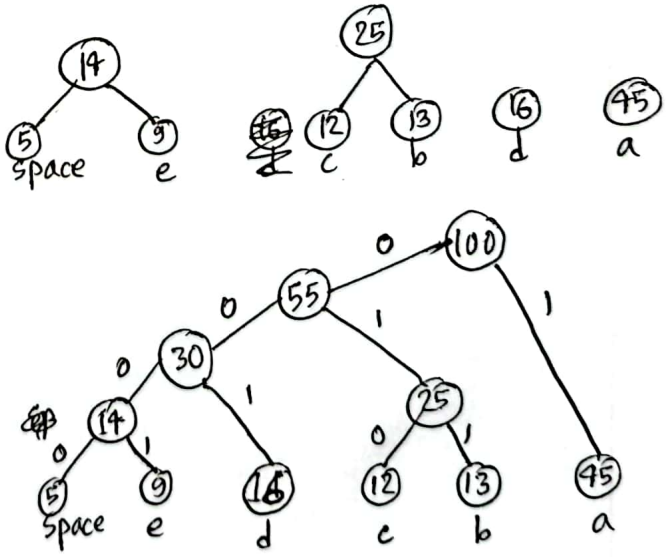
table size

$= 300 + 66$

$= 366$ bits

(d)

45	a	→ 000
13	b	→ 001
12	c	→ 010
16	d	→ 011
9	e	→ 100
5	space	→ 110



(e)

characters	a	b	c	d	e	space
Huffman code	1	011	010	001	0001	0000

(f) Encoding "abed ec"

a b e d ␣ e c

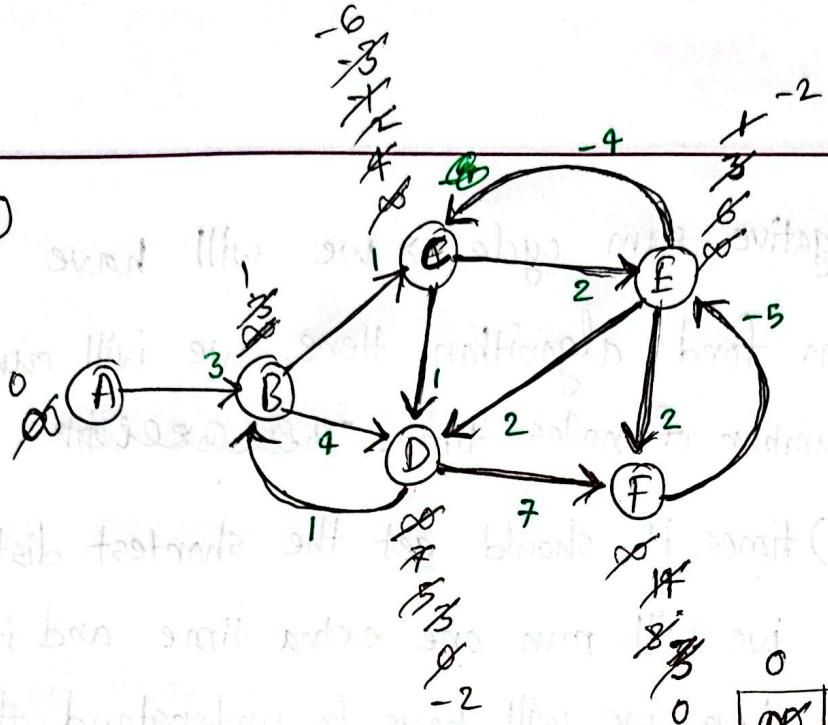
1 011 0001 001 0000 0001 010

∴ The encoded ~~code~~ bit ~~is~~ ~~1000~~

↳ 10110001001000000001010

(Ans)

(2) (a)



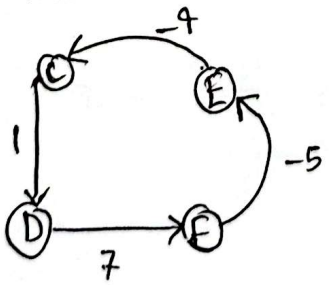
14-5 = 9
8-5 = 3
5-4 = 1
3-4 = -1
1-4 = -3

3-5 = -2
-3+2 = -1
-3+1 = -2

A	B	C	D	E	F

Q = { (A,0), (B,3), (C,4), (D,7), (E,6), (D,5), (F,4), (F,8), (C,2), (E,3), (D,3), (C,1), (E,1), (D,0), (F,3), (C,-3), (B,1), (E,-2), (D,-2), (F,0), (C,-6) ..... }

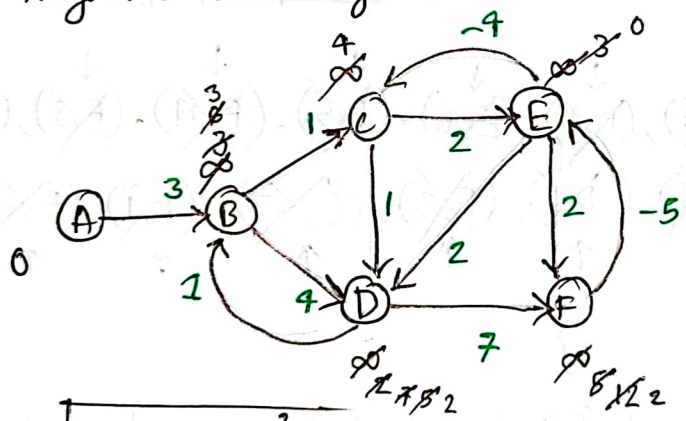
Here, dijkstra won't work (falls into loop) because there is a negative sum cycle here.



Total sum = -5 -4 +1 +7
= -1

(b) to detect negative sum cycle → we will have to use bellman ford algorithm. here, we will run (n-1) n=~~node~~ number of nodes time. ~~The first we will~~

By running (n-1) times, it should get the shortest distance but after that we will run one extra time and if it still updates then we will have to understand there is negative sum cycle.



node = 6
we will run
(6-1) = 5 times
and then 1 extra time

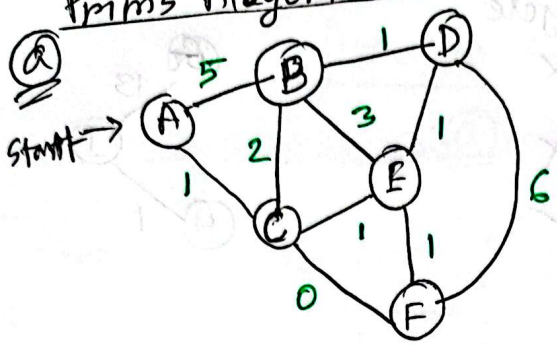
first	B		C		D		E		F	
	~~3~~		4		~~2~~		~~3~~		~~5~~	
∞	∞		∞		∞		∞		∞	
A	B		C		D		E		F	

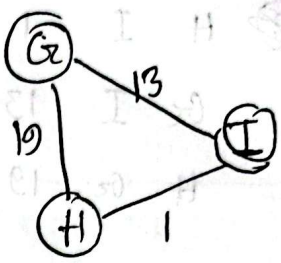
second	A	B	C	D	E	F
	0	~~6~~	4	2	0	12
		3				2

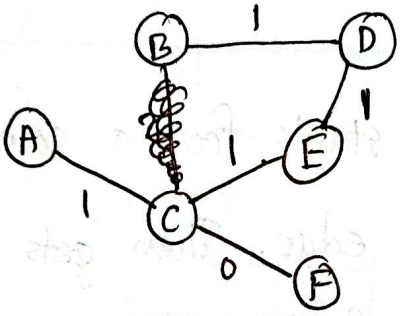
⋮

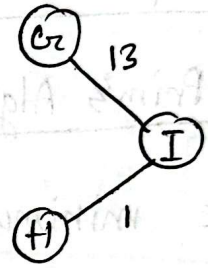
So on

(3) (a) Prim's Algorithm









Here, cost = 1+0+1+1+1

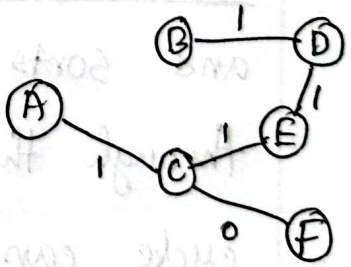
= 4

cost = 13+1 = 14

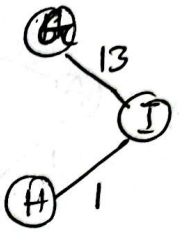
∴ Total cost = 4+14 = 18

(b) Kruskal's Algorithm

Edges			Sort				cycle
A	B	5	C	F	0	→	X
A	C	1	A	C	1	→	X
B	C	2	B	D	1	→	X
B	D	1	C	E	1	→	X
B	E	3	E	F	1	→	✓
C	E	1	D	E	1	→	X
C	F	0	B	C	2	→	✓
E	F	1	B	E	3	→	✓
D	E	1	A	B	5	→	✓
D	F	6	D	F	6	→	✓



sorted				cycle
H	I	1	→	✗
Gr	I	13	→	✗
H	Gr	19	→	✓



© Explanation:

① Prim's Algorithm: It starts from a source and takes the minimum weighted edge. Then gets access of another node and then both of the nodes search for ~~minimum~~ minimum weighted edge. Once it finds it, it adds the edge and then gets access of that node and the process continues. Also cycle is not possible here.

⑪ Kruskal's Algorithm: It considers all the edges and sorts it based on the weight. Then by going through the sorted edges it makes sure that no cycle can form. If no cycle is forming then takes the edge and adds it, if cycle is found then discards it. And the process continues. Cycle is not possible here also.

Ans. to the Q.No.4

(a)

Course	PHY112	CSE330	CSE331	CSE370	CSE499
(w) Credit	1	2	3	4	5
(v) value	9	7	15	12	16

			0	1	2	3	4	5	6	7	8	9
	v	0	0	0	0	0	0	0	0	0	0	0
1	9	PHY112	0	9	(9)	9	9	9	9	9	9	9
0	7	CSE330	0	9	9	16	16	16	16	16	16	16
1	15	CSE331	0	9	9	16	24	(24)	31	31	31	31
0	12	CSE370	0	9	9	16	24	24	31	31	36	36
1	16	CSE499	0	9	9	16	24	24	31	31	36	(40)

Selected courses = (PHY112, CSE331, CSE499)

(b)

Course	PHY 112	CSE 330	CSE 331	CSE 370	CSE 499
Credit	1	2	3	4	5
Value	9	7	15	12	16
Per credit value	$9/1 = 9$	$7/2 = 3.5$	$15/3 = 5$	$12/4 = 3$	$16/5 = 3.2$

Credit remaining	Course Taken	course credit	course value
9	PHY 112	1	9
8	CSE 331	3	15
5	CSE 330	2	7
3	CSE 370 is of 4 credits and CSE 499 is of 5 credits which already higher than 3 (remaining credits). So no more courses can be taken.		

$9 - 1 = 8$

$8 - 3 = 5$

$5 - 2 = 3$

$3 - 3 = 0$ ④

Total value $= 9 + 15 + 7 = 31$

∴ Zed can not select more valued courses than Wye.