#11809154

Graph Theory

Assignment-1

Q-1

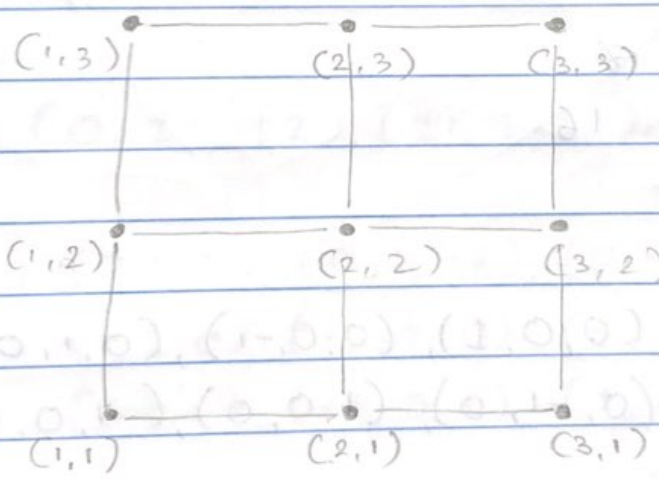
(A) $V = \{(i,j) : 1 \leq i, j \leq 3\}$

$\Rightarrow V = \{(1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3)\}$

(i,j) is adjacent to (p,q) iff

$|p-i| + |q-j| = 1$

Graph:



$n = 9$

$m = 12$

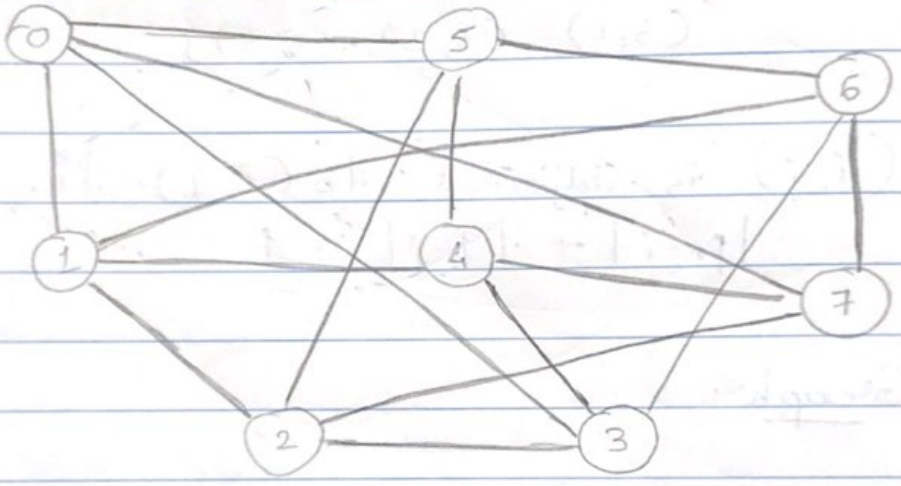
(B) $V = \{0, 1, 2, 3, 4, 5, 6, 7\}$

i is adjacent to j iff

i - j is odd.

1, 3, 5, 7

Graph:



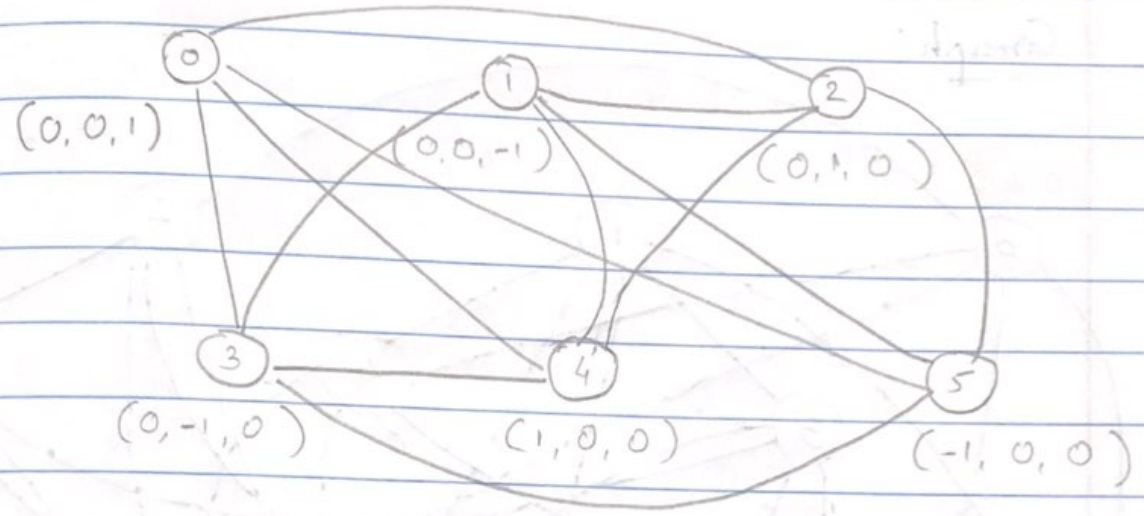
$n = 8$

$m = 16$

(C) $V = \{(0,0,1), (0,0,-1), (0,1,0), (0,-1,0), (1,0,0), (-1,0,0)\}$

(i, j, k) is adjacent to (p, q, r) iff they disagree in two position.

Graph:



$n = 6$

$m = 11$

(b) $V = \{(0, \pm 1, \pm 2), (\pm 1, \pm 2, 0), (\pm 2, 0, \pm 1)\}$.

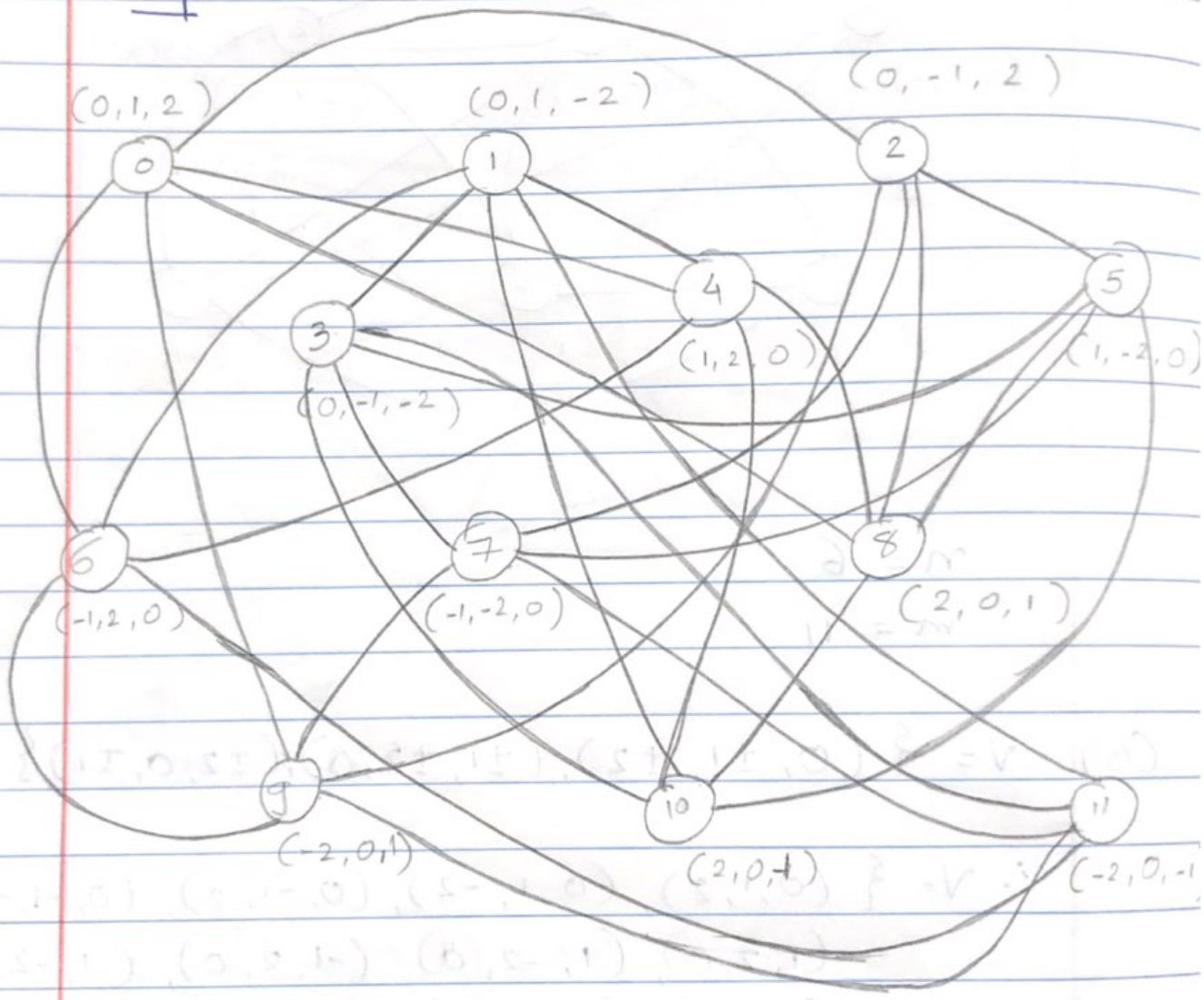
$\therefore V = \{(0,1,2), (0,1,-2), (0,-1,2), (0,-1,-2),$
$(1,2,0), (1,-2,0), (-1,2,0), (-1,-2,0),$
$(2,0,1), (-2,0,1), (2,0,-1), (-2,0,-1)\}$

(i, j, k) is adjacent to (p, q, r) iff the Euclidean distance between them satisfies $0 < d < 3$

Euclidean Distance

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

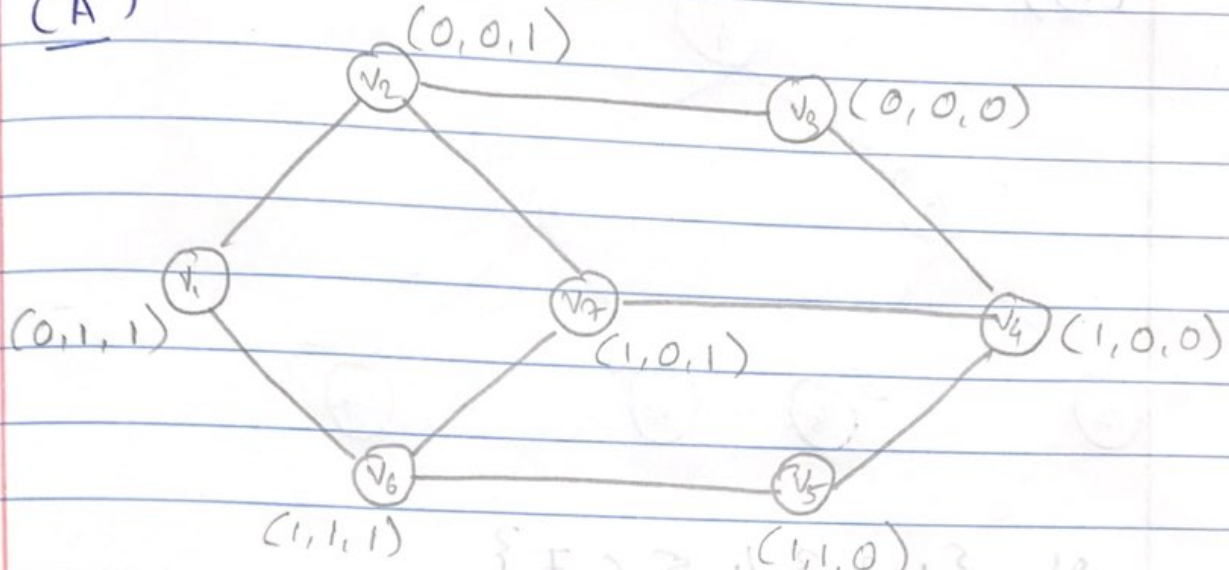
Graph:



$n = 12$

$m = 30$

Q-2 (A)

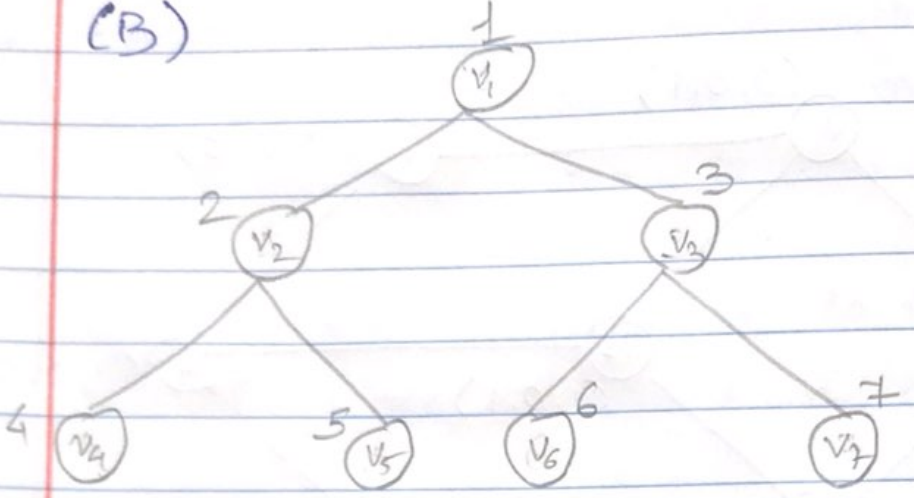


$V = \{(0,1,1), (0,0,1), (0,0,0), (1,0,0), (1,1,0), (1,1,1), \ldots (1,0,1)\}$

where two vertices are joined by an edge iff they are different in exactly one co-ordinate.

→ (i,j,k) is adjacent to (p,q,r) iff they are different in exactly one co-ordinate.

(B)



$V = \{1, 2, 3, 4, 5, 6, 7\}$

where two vertices are joined iff $2i - j$ satisfy $-2 < 2i - j \leq 0$

→ i is adjacent to j iff $-2 < 2i - j \leq 0$.