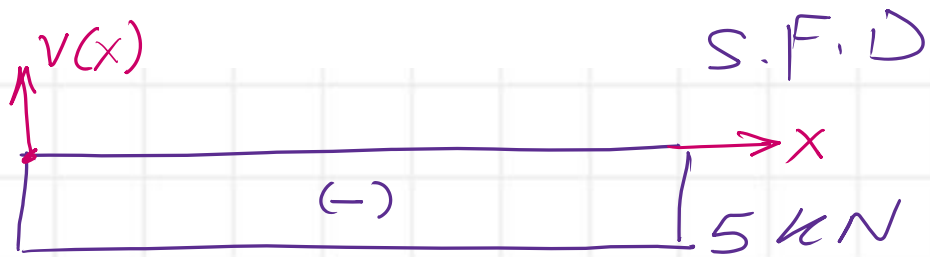
P7.32–P7.42 For the beams and loadings shown in Figures P7.32–P7.42,

(a) use discontinuity functions to write the expression for $w(x)$; include the beam reactions in this expression.

(b) integrate $w(x)$ twice to determine $V(x)$ and $M(x)$.

(c) use $V(x)$ and $M(x)$ to plot the shear-force and bending-moment diagrams.



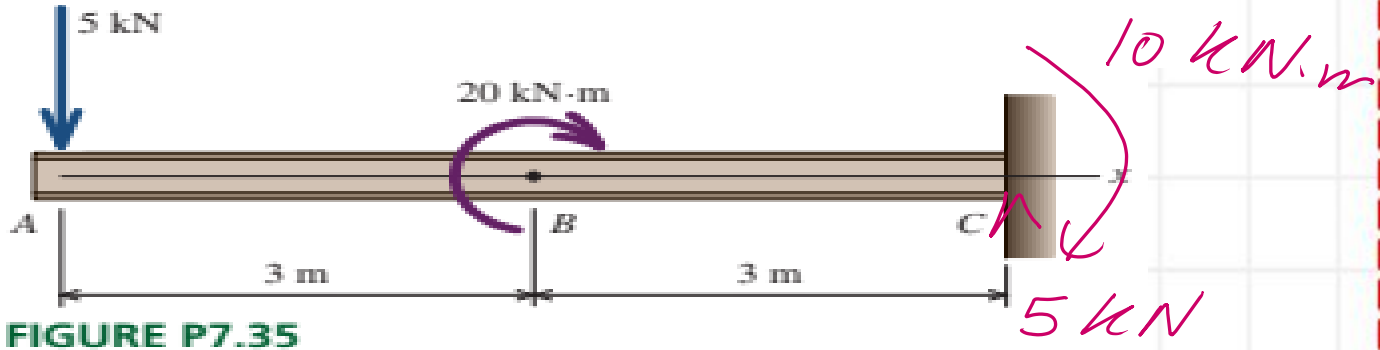
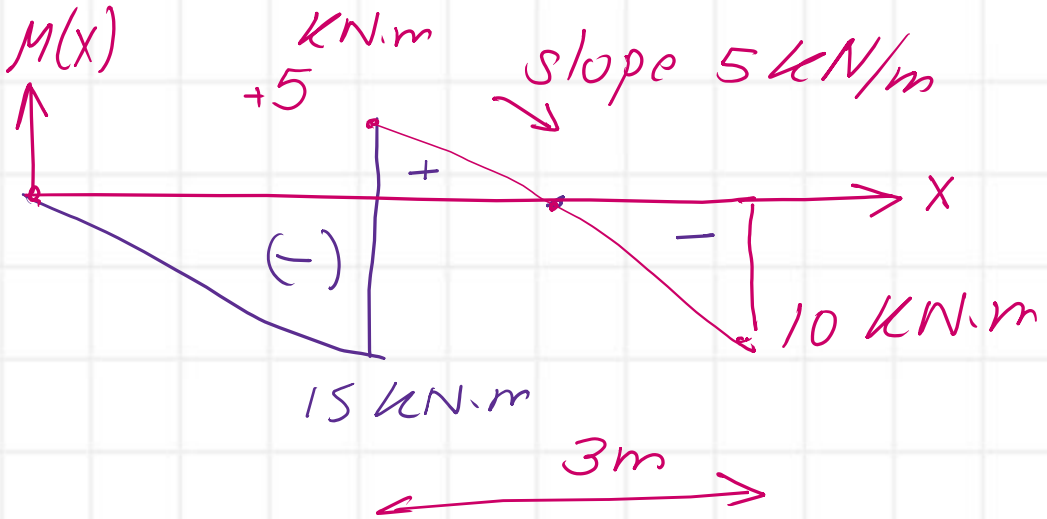


FIGURE P7.35



Prepared by Eng.Maged Kamel.

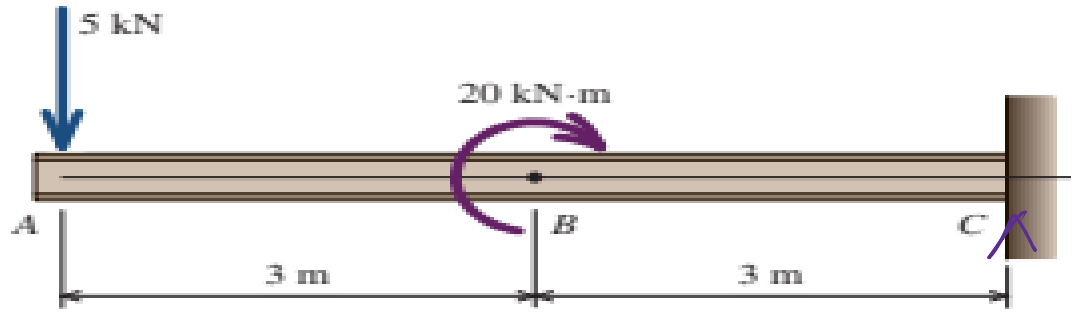


FIGURE P7.35

10 kN·m

step in x = 3

For moment has no effect

5kN

$$V(x) = -5\langle x-0\rangle^{0} + 20\langle x-3\rangle^{-1} + 5k\langle x-6\rangle^{0} + 10\langle x-6\rangle^{-1}$$

	A	B	C
12			
13	Distance x (m)	Shear V(x)-KN	Moment in KN-M
14	0	-5	0
15	1	-5	-5
16	2	-5	-10
17	3	-5	-15
18	3	-5	5
19	4	-5	0
20	5	-5	-5
21	6	-5	-10
22			
23			

=IF(AND(0<=A17,A17<=3),-5,IF(AND(3<A17,A17<=6),-5,0))

$A_{14} \Rightarrow x \geq 0$ $\quad V(x) = -5(1) = -5$ kN

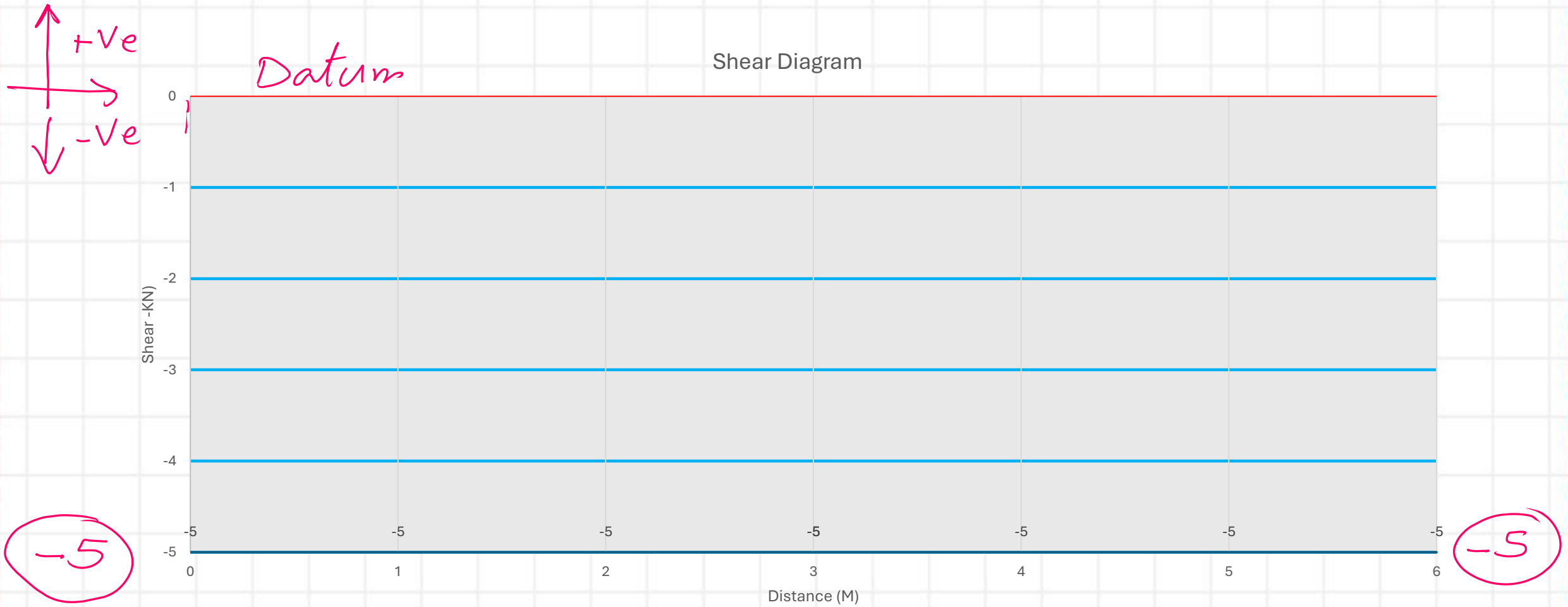
$A_{15} \Rightarrow x = 1$ $\quad V(x) = -5(1) = -5$ kN

$x \leq 3$ $\quad V(x) = -5(1) = -5$ kN

=IF(AND(0<=A18,A18<3),-5,IF(AND(3<=A18,A18<=6),-5,0))

$A_{18} \Rightarrow x > 3$ $\quad V(x) = -5(1) = -5$ kN

$A_{21} \rightarrow \leq 6$ $\quad V(x) = -5(1) = -5$ kN



=IF(AND(0<=A14,A14<3),-5,IF(AND(3<=A14,A14<=6),-5,0))

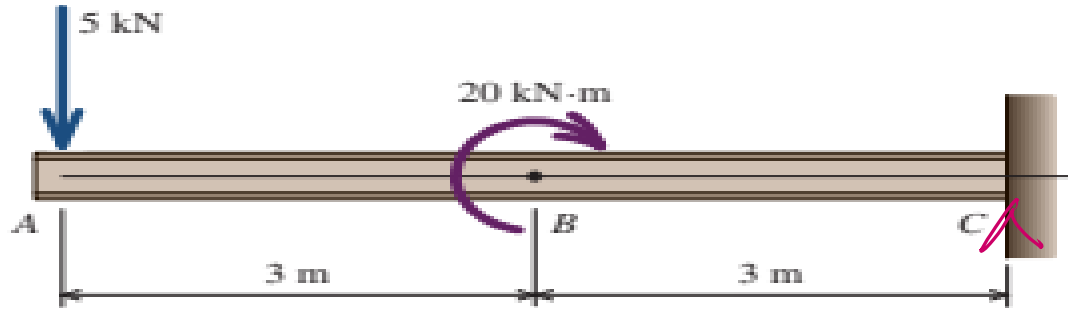


FIGURE P7.35

10 kN·m

↓ Step in x = 3

5kN For moment

$x > 6^{m}$

$M(x) = -5\langle x-0\rangle^{1} + 20\langle x-3\rangle^{0} + 5\langle x-6\rangle + 10\langle x-6\rangle^{0}$

	A	B	C
12			
13	Distance x (m)	Shear V(x)-KN	Moment in KN-M
14	0	-5	0
15	1	-5	-5
16	2	-5	-10
17	3	-5	-15
18	3	-5	5
19	4	-5	0
20	5	-5	-5
21	6	-5	-10
22			
23			

M =IF(AND(0<=A17,A17<=3),-5*A17,IF(AND(3<A17,A17<=6),-5*A17+20*1,0))

$x \geq 0 \Rightarrow M = 0$ KN·m

$x \leq 3 \rightarrow M = -5x$

$= -5(3)$

$= -15$ KN·m

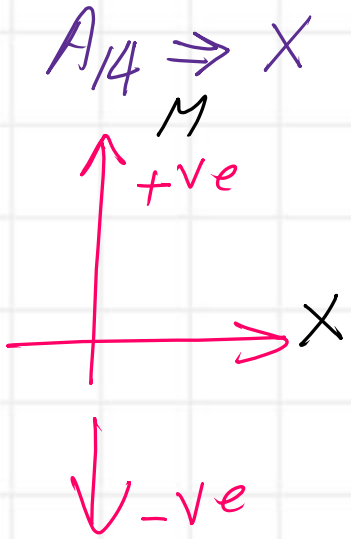
=IF(AND(0<=A18,A18<3),-5*A18,IF(AND(3<=A18,A18<=6),-5*A18+20*1,0))

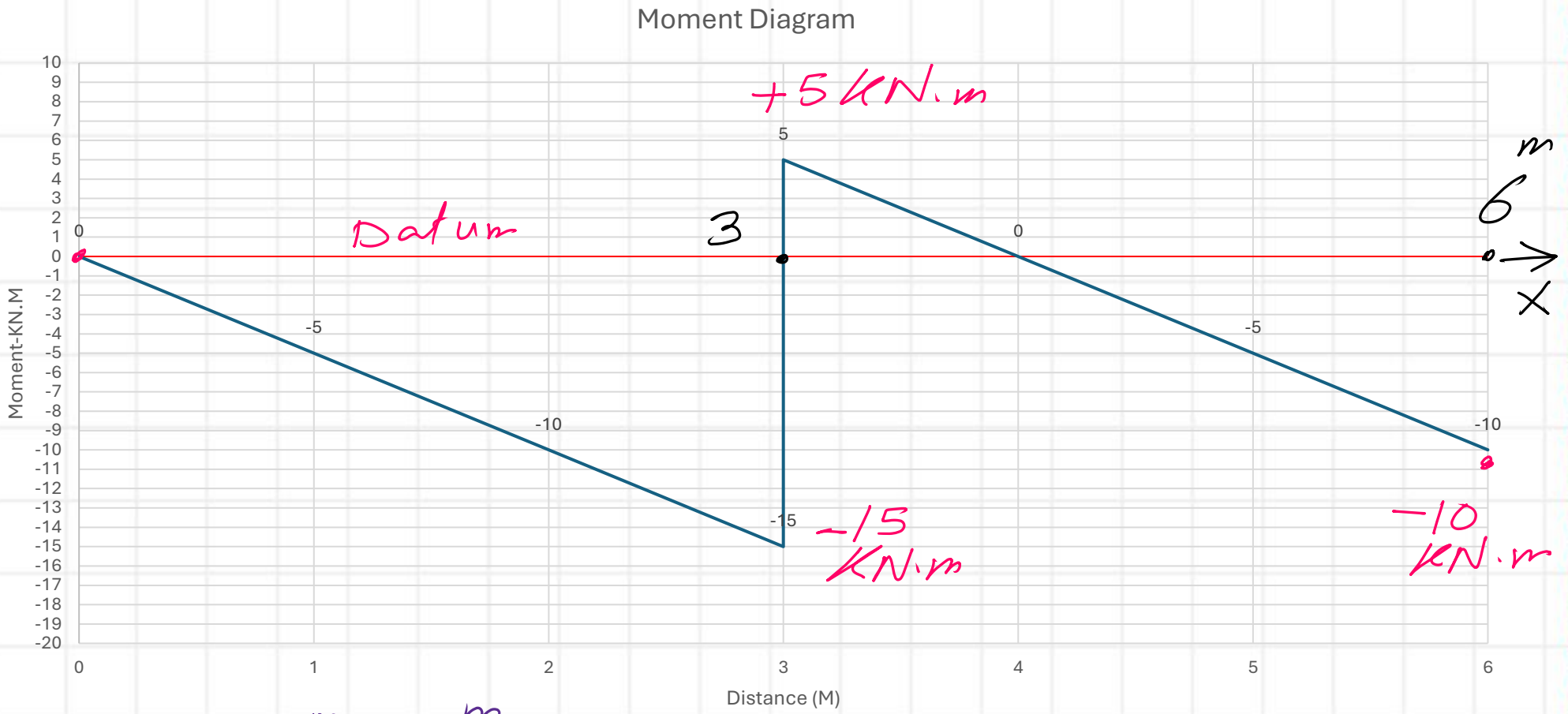
$x > 3\,m \leq 6\,m$

$M = -5(3)^{1} + 20(2)^{0} = +5$ KN·m

$M = -5(6)^{1} + 20(3)^{0} = -10$

=IF(AND(0<=A14,A14<=3),-5*A14,IF(AND(3<=A14,A14<=6),-5*A14+20,0))





3 m → 6 m Equation if and

=IF(AND(0<=A18,A18<3),-5*A18,IF(AND(3<=A18,A18<=6),-5*A18+20,0))