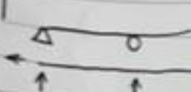
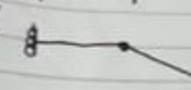


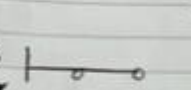
52%

Jonatha Triggs Exam.

f) F.1  $r=3, n=1, 3=3$ = Statically Determinate

F.2  $r=6, n=2, 6=3(2)$ = Statically determinate

F.3  $r=5, n=1, 5=3(1)+2$ = Statically indeterminate to the second degree

F.4  $r=10, n=3, 10=3(3)+1$ = Statically indeterminate to the first degree

g) frame structures are the combination of beam, column and slab to resist the lateral and gravity loads.
Two types: ridged framed structure + Braced frame structure

h) Over ridged = when there are too many members compared to joints
Under ridged = when there are not enough members compared to joints

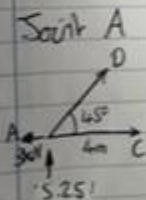
i) $m = 2j - 3$
 m = number of members
 j = number of joints
 $m > 2j - 3$ = Over ridged
 $m < 2j - 3$ = Under ridged

j) (i) Warren truss (ii) Pratt truss (iii) Howe truss
(iv) K-truss (v) Link truss

Q1-17

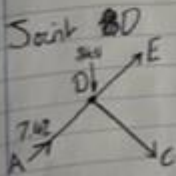
$$\begin{aligned}\Sigma HF &= 0 \\ HA + 3 &= 0 \\ HA &= -3\end{aligned}$$

Take moments about A
 $(8 \times 2) + (3 \times 2) - 8R_B = 0$
 $\frac{16 + 6}{8} = R_B$
 $R_B = 2.75 \text{ kN}$



$$\sum V_F = 0$$
$$5.25 + F_{AO} \sin 45 = 0$$
$$F_{AO} = \frac{-5.25}{\sin 45} = -7.421 \text{ (C)}$$

$$\begin{aligned} \Sigma H_F &= 0 \\ -3 + F_{AC} + F_{AO} \cos 45^\circ &= 0 \\ F_{AC} &= 3 - (7.42 \cos 45^\circ) \\ F_{AC} &= -8.25 \text{ kN (T)} \end{aligned}$$



$$\begin{aligned} 2VF &= 0 \\ (FAO \sin 45^\circ) + 8 + (FDE \sin 45^\circ) - (FDC \sin 45^\circ) &= 0 \\ (7.42 \sin 45^\circ) + 8 + (FDE \sin 45^\circ) - (FDC \sin 45^\circ) &= 0 \\ \frac{5.25 - 8 + (FDE \sin 45^\circ) - FDC (\sin 45^\circ)}{\sin 45^\circ} &= 0 \\ FDE - FDC &= 2.75 \\ \frac{FDE - FDC}{\sin 45^\circ} &= 3.89 \quad \dots (1) \end{aligned}$$

$$\Sigma H_F = 0$$

$$F_{AD} \cos 45^\circ + F_{DE} \cos 45^\circ + F_{DC} \cos 45^\circ = 0$$

$$F_{DE} + F_{DC} = -7.42 \quad \dots (2)$$

$$\text{Add (1) + (2)}$$

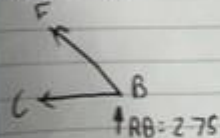
$$2F_{DE} = -3.53$$

$$F_{DE} = -1.77$$

$$-F_{DC} = 3.89 - (-1.77)$$

$$F_{DC} = -5.66$$

Joint B



$$\Sigma V_F = 0$$

$$2.75 + F_{BF}(\sin 45^\circ) = 0$$

$$F_{BF} = \frac{-2.75}{\sin 45^\circ}$$

$$F_{BF} = -3.89 (C)$$

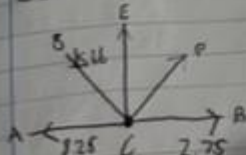
$$\Sigma H_F = 0$$

$$-F_{CB} - 3.89 \cos 45^\circ = 0$$

$$F_{CB} = -3.89 \cos 45^\circ$$

$$F_{CB} = -2.75 (T)$$

Joint C



$$\Sigma H_F = 0 \quad -8.25 + (5.66 \cos 45^\circ) + 2.75 = 0$$

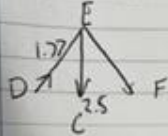
$$F_{FC} \cos 45^\circ = 8.25 - (5.66 \cos 45^\circ) - 2.75$$

$$F_{FC} = \frac{8.25 - 5.66 \cos 45^\circ - 2.75}{\cos 45^\circ}$$

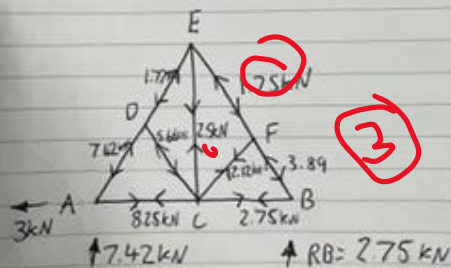
$$F_{FC} = 2.12$$

$$\begin{aligned}\sum V F &= 0 \\ (-5.66 \sin 45) + F_{EL} + F_{CF} \sin 45 &= 0 \\ F_{EC} &= (5.66 \sin 45) - (2.12 \sin 45) \\ &= 2.5 \text{ (T)}\end{aligned}$$

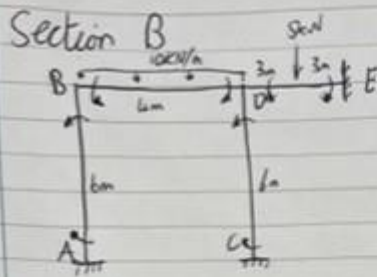
Joint E



$$\begin{aligned}\sum H F &= 0 \\ 1.77 \cos 45 + F_{EF} &= 0 \\ F_{EF} &= -1.77 \cos 45 \\ &= -1.25 \text{ (C)}\end{aligned}$$



Q4-22



Fixed End moment
 $BD = \frac{wl^2}{12} = \frac{10 \times 4^2}{12} = 13.3$
 $DE = \frac{Pl}{8} = \frac{5 \times 6}{8} = 3.75$

Unit ①

Distribution Factor

$$DF_{AB} = \frac{k_{AB}}{k_{AB} + k_{BD}} = \frac{\frac{1}{6}}{\frac{1}{6} + \frac{1}{4}} = 0.4$$

$$DF_{BD} = \frac{k_{BD}}{k_{BD} + k_{BA}} = \frac{\frac{1}{4}}{\frac{1}{4} + \frac{1}{6}} = 0.6$$

$$DF_{DB} = \frac{k_{DB}}{k_{DB} + k_{DC} + k_{DE}} = \frac{\frac{1}{4}}{\frac{1}{4} + \frac{1}{6} + \frac{1}{6}} = 0.42$$

$$DF_{DC} = \frac{k_{DC}}{k_{DC} + k_{DB} + k_{DE}} = \frac{\frac{1}{6}}{\frac{1}{6} + \frac{1}{4} + \frac{1}{6}} = 0.29$$

$$DF_{DE} = \frac{k_{DE}}{k_{DE} + k_{DC} + k_{DB}} = \frac{\frac{1}{6}}{\frac{1}{6} + \frac{1}{4} + \frac{1}{6}} = 0.29$$

	AB	BD	DB	DC	CD	ED	DE
DF	0	0.4	0.6	0.42	0.29	0	0
Fix End moment	0	0	-13.3	-13.3	0	-3.75	3.75
balance	0	5.32	7.98	-4.01	2.77	0	0
carry over	2.66	0	-2.00	3.99	0	1.39	0
balance	0	0.8	1.2	-1.68	1.16	0	1.385
carry over	0.4	0	-0.84	0.6	0	-0.58	0
balance	0	-0.34	0.5	-0.25	0.17	0	-0.58
carry over	0.17	0	-0.125	0.25	0	-0.09	0
balance	0	0.08	0.08	-0.125	0.09	0	-0.09
	3.23	6.51	6.78	-1.20	4.03	-2.03	0

Q3 - 13