

**ΛΥΣΕΙΣ ΠΑΓΚΥΠΡΙΩΝ ΕΞΕΤΑΣΕΩΝ ΓΙΑ ΔΙΚΤΥΩΜΑΤΑ****2006-A**

3.

$$\Sigma F_y = 0$$

$$-60 - F_{\Gamma A} \eta\mu 30^\circ = 0$$

$$F_{\Gamma A} \eta\mu 30^\circ = -60$$

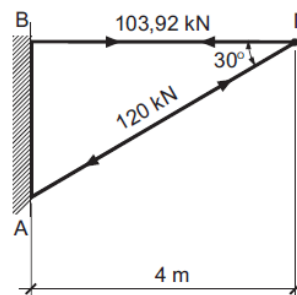
$$F_{\Gamma A} = \frac{-60}{0,5} = -120 \text{ kN (θλίψη)}$$

$$\Sigma F_x = 0$$

$$-F_{\Gamma B} - F_{\Gamma A} \sigma\upsilon\nu 30^\circ = 0$$

$$-(-120) 0,866 = F_{\Gamma B}$$

$$F_{\Gamma B} = 103,92 \text{ kN (εφελκυσμός)}$$



## 2006-B

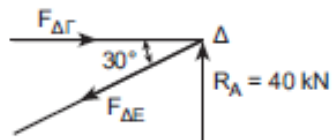
14.

**Αντιδράσεις**

$$R_A = R_{\Delta} = 40 \text{ kN}$$

(Λόγω συμμετρίας της φόρτισης)

(α) Κόμβος Δ



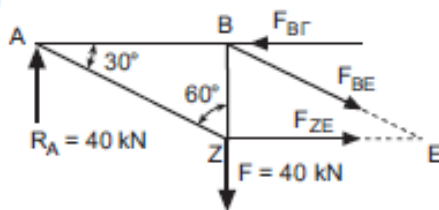
$$\Sigma F_y = +R_A - F_{\Delta E} \cdot \sigma\upsilon\nu 60^\circ = 0$$

$$F_{\Delta E} = 40 / 0,5 = 80 \text{ kN (Εφελκυστική)}$$

$$\Sigma F_x = F_{\Delta \Gamma} - F_{\Delta E} \cdot \sigma\upsilon\nu 30^\circ = 0$$

$$F_{\Delta \Gamma} = 80 \cdot 0,866 = 69,3 \text{ kN (Θλιπτική)}$$

(β)



$$BZ = \epsilon\phi 30^\circ \cdot AB = 0,577 \cdot 5,0 = 2,89 \text{ m}$$

$$\Sigma M_B = 0$$

$$R_A \cdot 5 - F_{ZE} \cdot 2,89 = 0$$

$$F_{ZE} = 40 \cdot 5 / 2,89 = 69,20 \text{ kN (Εφελκυστική)}$$

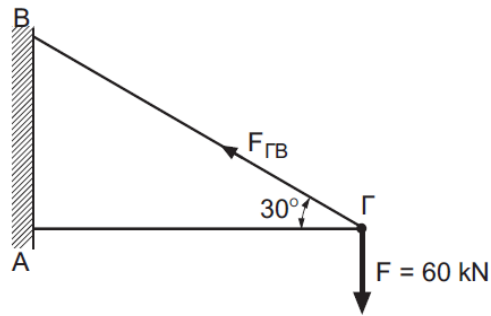
$$\Sigma M_E = 0$$

$$R_A \cdot 10 - 40 \cdot 5 - F_{B\Gamma} \cdot 2,89 = 0$$

$$F_{B\Gamma} = \frac{40 \cdot 10 - 40 \cdot 5}{2,89} = 69,20 \text{ kN (Θλιπτική)}$$

## 2007-A

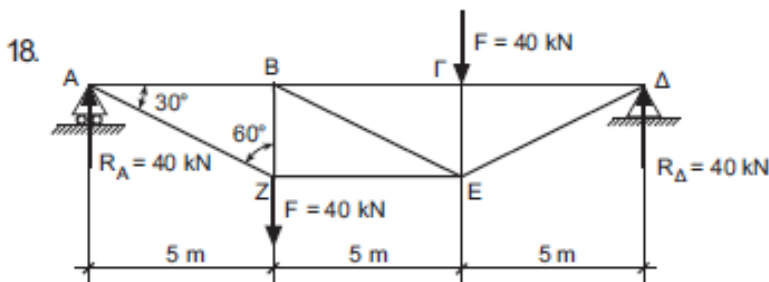
5.



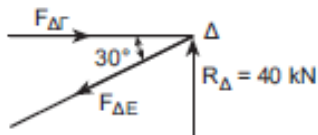
$$\Sigma F_y = 0$$

$$F_{GB} = 60 \text{ kN} / \sin 60^\circ = 120 \text{ kN} \text{ (εφελκυστική)}$$

## 2007-Γ



(α) Κόμβος Δ

Ένεκα συμμετρίας  $R_A = R_\Delta = 40 \text{ kN}$ 

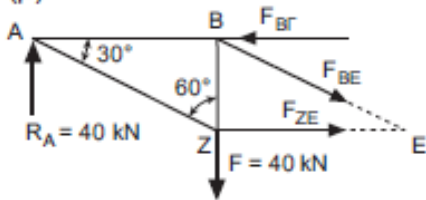
$$\Sigma F_y = +R_\Delta - F_{\Delta E} \cdot \sin 60^\circ = 0$$

$$F_{\Delta E} = 40 / 0,5 = 80 \text{ kN} \text{ (Εφελκυστική)}$$

$$\Sigma F_x = F_{\Delta \Gamma} - F_{\Delta E} \cdot \sin 30^\circ = 0$$

$$F_{\Delta \Gamma} = 80 \cdot 0,866 = 69,3 \text{ kN} \text{ (Θλιπτική)}$$

(β)



$$BZ = \epsilon\phi 30^\circ \cdot AB = 0,577 \cdot 5,0 = 2,89 \text{ m}$$

$$\Sigma M_B = 0$$

$$R_A \cdot 5 - F_{ZE} \cdot 2,89 = 0$$

$$F_{ZE} = 40 \cdot 5 / 2,89 = 69,20 \text{ kN} \text{ (Εφελκυστική)}$$

$$\Sigma M_E = 0$$

$$R_A \cdot 10 - 40 \cdot 5 - F_{B\Gamma} \cdot 2,89 = 0$$

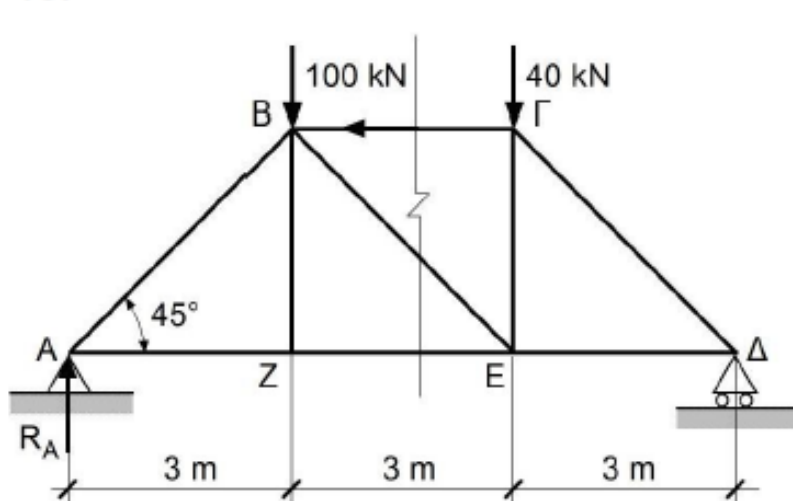
$$F_{B\Gamma} = \frac{40 \cdot 10 - 40 \cdot 5}{2,89} = 69,20 \text{ kN} \text{ (Θλιπτική)}$$

## 2008-A

$$\begin{aligned}
 9. \quad \Sigma M_A = 0 & \quad -80 \cdot 4 + R_B \cdot 4 = 0 & R_B = 80 \text{ kN} & \quad R_H = 80 \text{ kN} \\
 \Sigma M_B = 0 & \quad -80 \cdot 4 - R_A \cdot 4 = 0 & R_A = -80 \text{ kN}
 \end{aligned}$$

## 2008-B

15.



$$\Sigma M_A = 0 \quad 100 \cdot 3 + 40 \cdot 6 - R_{\Delta} \cdot 9 = 0$$

$$540 = R_{\Delta} \cdot 9 \quad R_{\Delta} = 60 \text{ kN}$$

$$\Sigma M_B = 0 \quad R_A \cdot 9 - 100 \cdot 6 - 40 \cdot 3 = 0$$

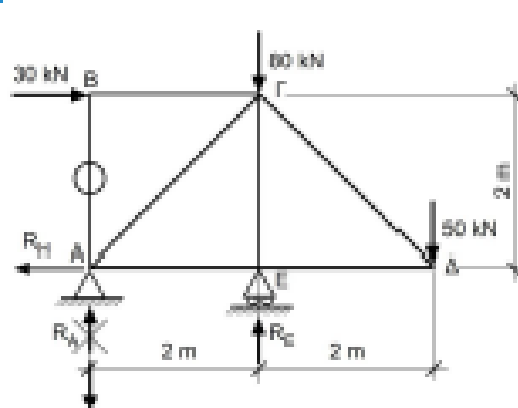
$$R_A \cdot 9 = 720 \quad R_A = 80 \text{ kN}$$

$$\Sigma M_E = 0 \quad R_A \cdot 6 - 100 \cdot 3 - F_{(B\Gamma)} \cdot 3 = 0$$

$$80 \cdot 6 - 300 = F_{(B\Gamma)} \cdot 3 \quad F_{(B\Gamma)} = 60 \text{ kN}$$

## 2008-Γ

18.



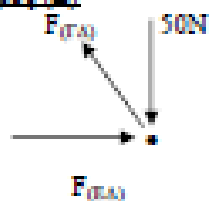
$$\begin{aligned}\Sigma M_A = 0 : 30 \cdot 2 + 80 \cdot 2 + 50 \cdot 4 - R_C \cdot 2 &= 0 \\ 60 + 160 + 200 &= R_C \cdot 2 \\ 420 &= R_C \cdot 2 \\ R_C &= 210 \text{ N}\end{aligned}$$

$$\begin{aligned}\Sigma M_B = 0 : R_A \cdot 2 + 30 \cdot 2 + 50 \cdot 2 &= 0 \\ R_A \cdot 2 &= -60 - 100 \\ R_A &= -80 \text{ N}\end{aligned}$$

Παβδος	Θλιψη	Εφελκ.
$F_{(A\Gamma)}$	-	-
$F_{(B\Gamma)}$	30	-
$F_{(B\Delta)}$	-	70,72
$F_{(B\Lambda)}$	50	-
$F_{(A\Lambda)}$	50	-
$F_{(B\Gamma)}$	210	-
$F_{(A\Gamma)}$	-	113,13

$F_{(A\Lambda)} = 0$

Κουβος (A)

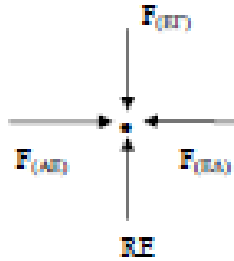


$$\begin{aligned}\Sigma f_y = 0 \\ -50 + F_{(B\Delta)} \cdot 0,707 &= 0\end{aligned}$$

$$F_{(B\Delta)} = \frac{50}{0,707} = 70,72 \text{ N}$$

$$\Sigma F_x = 0 \quad F_{(B\Delta)} - F_{(A\Gamma)} \cdot 0,707 = 0$$

$$F_{(B\Delta)} = 50 \text{ N}$$

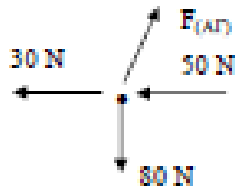
Κουβος (E)

$$F_{(AT)} = F_{(BA)}$$

$$F_{(AT)} = 50 \text{ N}$$

$$F_{(RT)} = RE$$

$$F_{(RT)} = 210 \text{ N}$$

Κουβος (A)

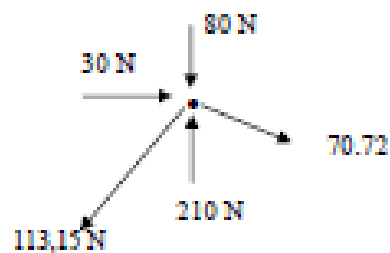
$$\Sigma F_y = 0$$

$$F_{(AT)} \cdot 0,707 - 80 = 0$$

$$F_{(AT)} = \frac{80}{0,707} = 113,15 \text{ N}$$

Κουβος (B)

$$F_{(RT)} = 30 \text{ N} = F_1$$

ΕπιλογήΚουβος (Γ)

$$\Sigma F_x = 0$$

$$30 + 70,72 - 0,707 - 113,15 - 0,707 = 0$$

$$30 + 50 - 80 = 0$$

$$\Sigma F_y = 0$$

$$+ 210 - 80 - 70,72 - 0,707 - 113,15 - 0,707 = 0$$

$$+ 210 - 80 - 50 - 80 = 0$$

$$210 - 210 = 0$$

### 2009-A

3.

$$\Sigma F_y = 0$$

$$-50 - F_{\Gamma A} \eta\mu 30^\circ = 0$$

$$F_{\Gamma A} \eta\mu 30^\circ = -50$$

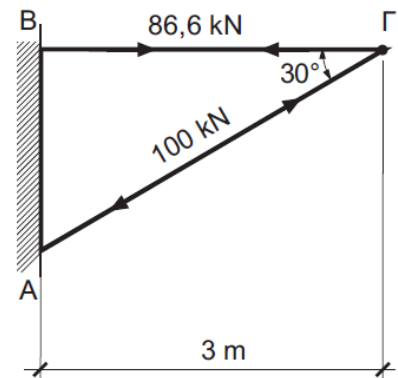
$$F_{\Gamma A} = \frac{-50}{0,5} = -100 \text{ kN (θλίψη)}$$

$$\Sigma F_x = 0$$

$$- F_{\Gamma B} - F_{\Gamma A} \sigma\upsilon\nu 30^\circ = 0$$

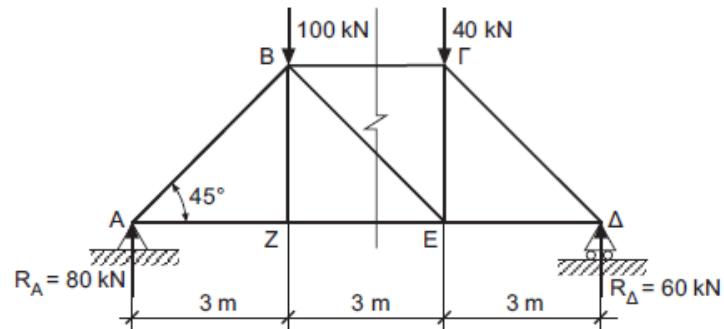
$$-(-100) 0,866 = F_{\Gamma B}$$

$$F_{\Gamma B} = 86,6 \text{ kN (εφελκυσμός)}$$



## 2009-B

15.



$$\Sigma M_A = 0$$

$$100 \cdot 3 + 40 \cdot 6 - R_{\Delta} \cdot 9 = 0$$

$$540 = R_{\Delta} \cdot 9$$

$$R_{\Delta} = 60 \text{ kN}$$

$$\Sigma M_{\Delta} = 0$$

$$R_A \cdot 9 - 100 \cdot 6 - 40 \cdot 3 = 0$$

$$R_A \cdot 9 = 720$$

$$R_A = 80 \text{ kN}$$

$$\Sigma M_E = 0$$

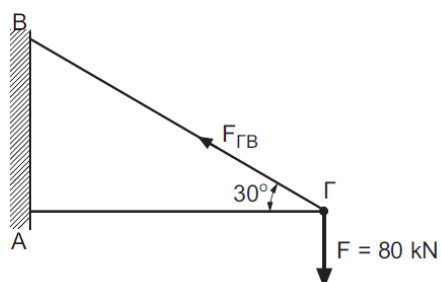
$$R_A \cdot 6 - 100 \cdot 3 + F_{(B\Gamma)} \cdot 3 = 0$$

$$80 \cdot 6 - 300 = - F_{(B\Gamma)} \cdot 3$$

$$F_{(B\Gamma)} = - 60 \text{ kN (Θλίψη)}$$

## 2010-A

3.



$$\Sigma F_y = 0$$

$$F_{GB} = 80 \text{ kN} / \eta_{\mu 30^\circ} = 160 \text{ kN (εφελκυστική)}$$



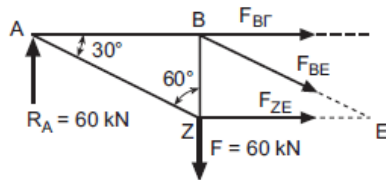
## 2010-B

14.

## Αντιδράσεις

$$R_A = R_D = 60 \text{ kN}$$

(Λόγω συμμετρίας της φόρτισης)



$$BZ = \varepsilon\varphi 30^\circ \cdot AB = 0,577 \cdot 4,0 = 2,31 \text{ m}$$

$$\Sigma M_B = 0$$

$$R_A \cdot 4 - F_{ZE} \cdot 2,31 = 0$$

$$F_{ZE} = 60 \cdot 4 / 2,31 = 103,9 \text{ kN (Εφελκυστική)}$$

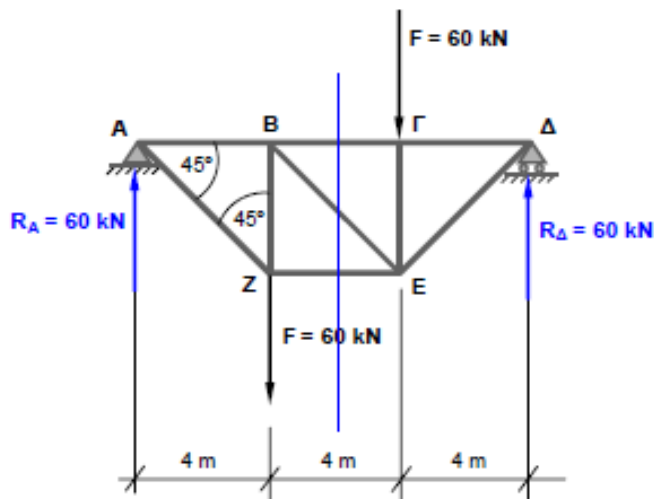
$$\Sigma M_E = 0$$

$$R_A \cdot 8 - 60 \cdot 4 + F_{B\Gamma} \cdot 2,31 = 0$$

$$F_{B\Gamma} = \frac{-60 \cdot 8 + 60 \cdot 4}{2,31} = -103,90 \text{ kN (Θλιπτική)}$$

## 2011-A

12. Να υπολογίσετε το μέγεθος και να καθορίσετε το είδος της καταπόνησης στη ράβδο ΒΓ του δικτυώματος του σχήματος 11, με τη μέθοδο των τομών.

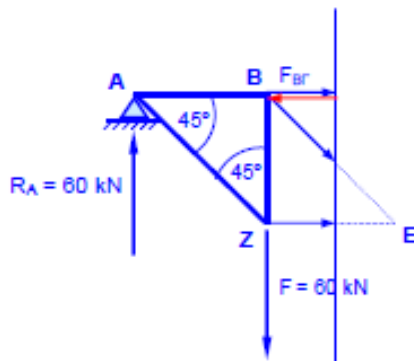


ΣΧΗΜΑ 11

$$\Sigma F_y = 0$$

$$R_A + R_{\Delta} - 60 - 60 = 0$$

$$R_A = R_{\Delta} = 60 \text{ kN}$$



$$\Sigma M_E = 0$$

$$R_A \cdot 8 - 60 \cdot 4 + F_{BR} \cdot 4 = 0$$

$$60 \cdot 8 - 60 \cdot 4 + 4F_{BR} = 0$$

$$F_{BR} = -60 \text{ kN} \rightarrow$$

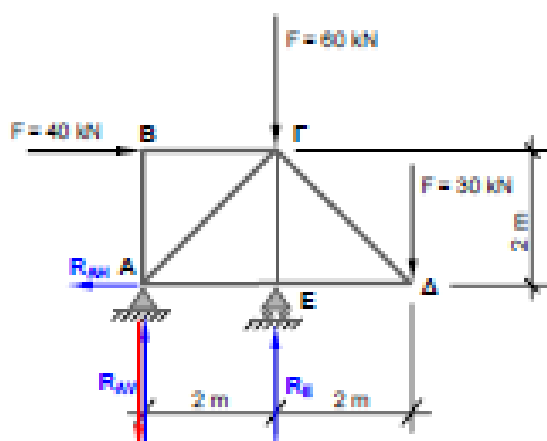
$\rightarrow$  θλαβόμενη ράβδος

## 2011-B

14. Δίνεται δικτύωμα με διαστάσεις και φορτία όπως φαίνεται στο σχήμα 13.

(α) Να υπολογίσετε τις αντιδράσεις στις στηρίξεις A και E.

(β) Να υπολογίσετε το μέγεθος και να καθορίσετε το είδος της καταπόνησης στις ράβδους ΒΑ, ΒΓ, ΔΓ και ΔΕ.



ΣΧΗΜΑ 13

$$\Sigma F_x = 0 \rightarrow R_{AH} = 40 \text{ kN}$$

$$\Sigma M_A = 0$$

$$40 \cdot 2 + 60 \cdot 2 + 30 \cdot 4 - R_E \cdot 2 = 0$$

$$R_E = 160 \text{ kN}$$

$$\Sigma M_E = 0$$

$$R_{AV} \cdot 2 + 40 \cdot 2 + 30 \cdot 2 = 0$$

$$R_{AV} = -70 \text{ kN}$$

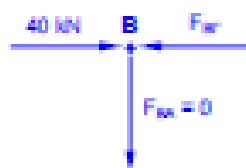
Έλεγχος:

$$\Sigma F_y = 0$$

$$R_{AV} + R_E - 60 - 30 = 0$$

$$-70 + 160 - 60 - 30 = 0$$

Κόμβος Β

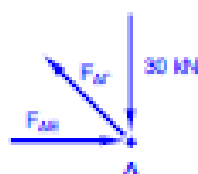


Κόμβος Β

$$\Sigma F_x = 0 \rightarrow F_{B\Gamma} = \underline{40 \text{ kN}} \text{ θλιβόμενη}$$

$$\Sigma F_y = 0 \rightarrow F_{B\Delta} = \underline{0}$$

Κόμβος Δ



Κόμβος Δ

$$\Sigma F_y = 0 \rightarrow F_{\Delta\Gamma} \cdot \eta\mu 45^\circ - 30 = 0$$

$$F_{\Delta\Gamma} = \underline{42,42 \text{ kN}} \text{ τενετώμενη}$$

$$\Sigma F_x = 0 \rightarrow F_{\Delta\epsilon} - F_{\Delta\Gamma} \cdot \sigma\eta\mu 45^\circ = 0$$

$$F_{\Delta\epsilon} = \underline{30 \text{ kN}} \text{ θλιβόμενη}$$