

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENGAJIAN POLITEKNIK
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2014

CC601: STRUCTURAL ANALYSIS 2

TARIKH : 03 NOVEMBER 2014
MASA : 11.15 AM - 1.15 PM (2 JAM)

Kertas ini mengandungi **EMPAT BELAS (14)** halaman bercetak.

Bahagian A: Soalan Pendek (10 soalan)

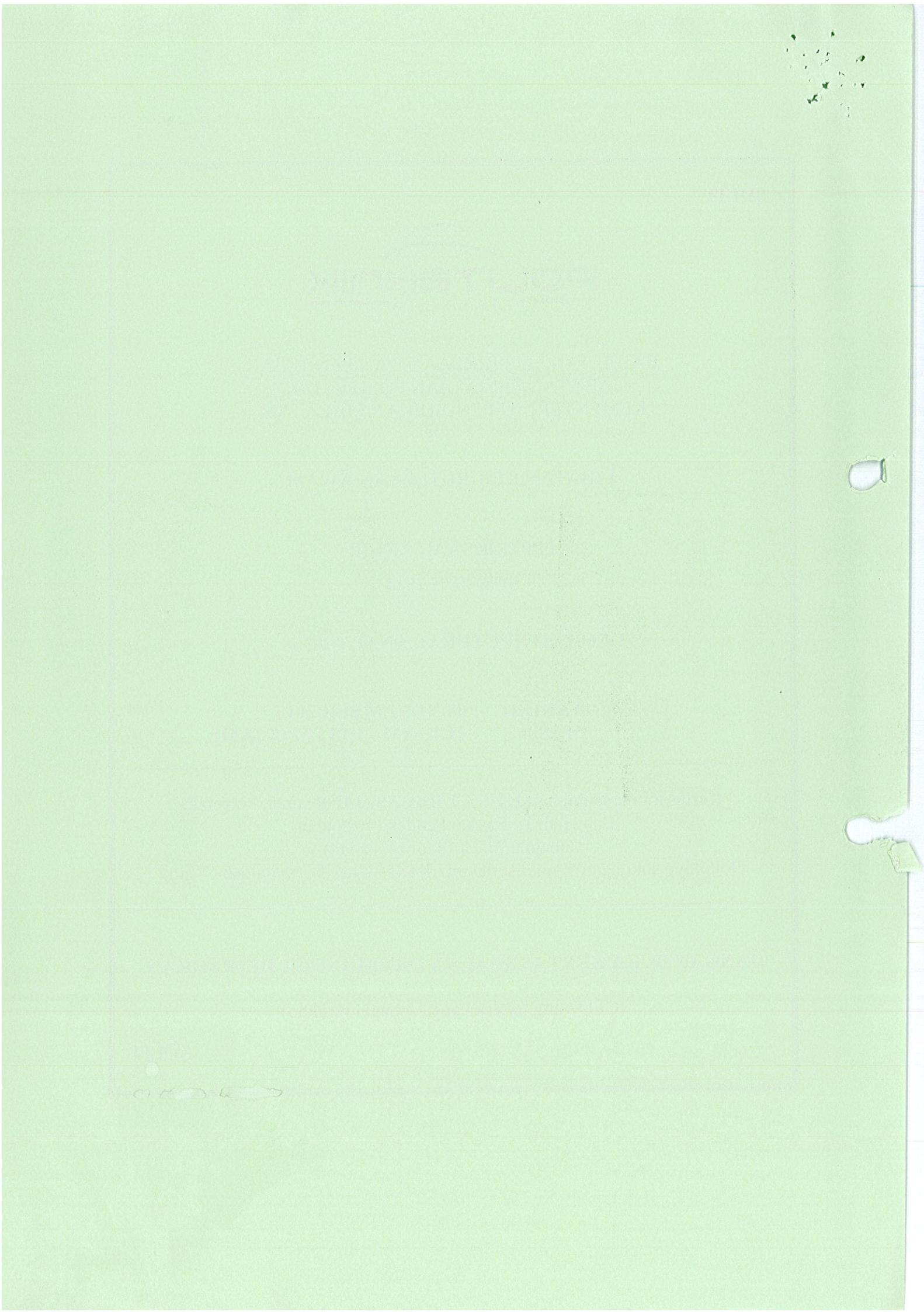
Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf, Formula dsb / Tiada

JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT



SECTION A: 40 MARKS
BAHAGIAN A: 40 MARKAH

INSTRUCTION:

This section consists of **TEN (10)** short questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi **SEPULUH (10)** soalan pendek. Jawab **SEMUA** soalan.

QUESTION 1**SOALAN 1**

CLO1
C1

A simple truss is subjected to a load as shown in **Figure A1**. Determine the force in member AB using the method of joint. Given the vertical reaction at A of 20 kN.

Satu kerangka dikenakan beban seperti yang ditunjukkan dalam **Rajah A1**. Tentukan daya dalam AB dengan menggunakan kaedah sendi. Diberi tindakbalas di A ialah 20 kN.

[4 marks]
[4 markah]

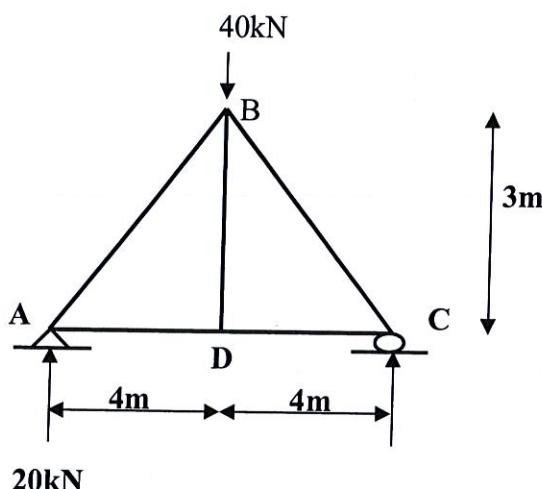


Figure A1 / Rajah A1

QUESTION 2
SOALAN 2

- CLO2
C2 Recognize the type of internal forces for member AE, EC, BC and FC in **Figure A2** below either in compression or tension condition.

Kenalpasti jenis daya dalaman pada anggota AE, EC, BC dan FC pada Rajah A2 di bawah samada dalam keadaan mampatan atau tegangan.

[4 marks]
[4 markah]

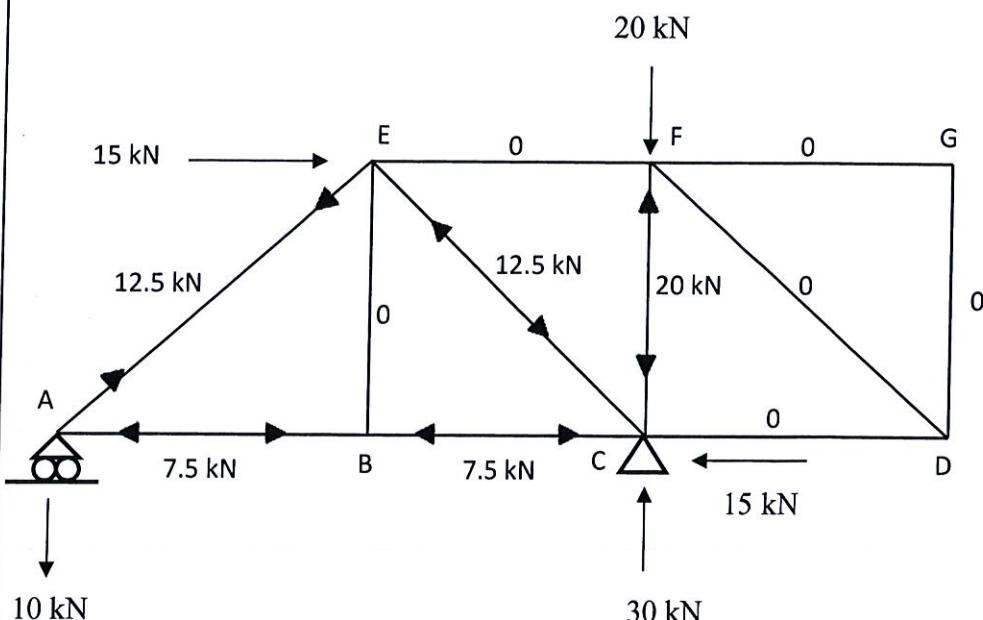


Figure A2 / Rajah A2

QUESTION 3
SOALAN 3

- CLO2
C1 State the other **TWO (2)** factors that causes truss displacement besides being due to external loads.

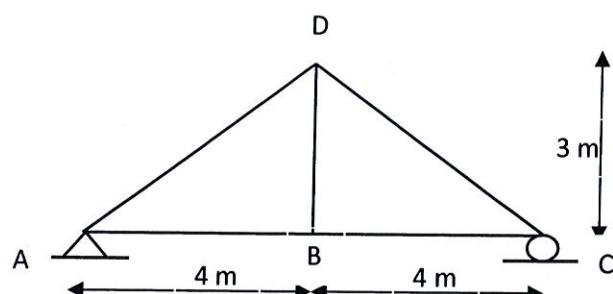
*Nyatakan **DUA (2)** faktor yang menyebabkan anjakan kekuda selain faktor beban luar.*

[4 marks]
[4 markah]

QUESTION 4
SOALAN 4

- CLO1
C2 Calculate the vertical displacement of joint B if only BD member of the truss in **Figure A4** experience a temperature increase of 20°C . Take into account the coefficient of thermal expansion, $c = 10.5 \times 10^{-6}/^\circ\text{C}$.

Tentukan anjakan pugak sendi B jika hanya ahli BD pada kerangka dalam **Rajah A4** mengalami pertambahan suhu sebanyak 20°C . Ambil nilai pekali pengembangan, $c = 10.5 \times 10^{-6}/^\circ\text{C}$



[4 marks]
[4 markah]

Figure A4 / Rajah A4

QUESTION 5
SOALAN 5

- CLO1
C2 By referring to **Figure A5 (a) and (b)**, classify whether the truss is internally indeterminate structure, externally indeterminate structure or a combination of both.

Merujuk kepada **Rajah A5 (a) dan (b)**, kelaskan sama ada struktur ini mempunyai lebih dalaman, luaran atau gabungan antara keduanya

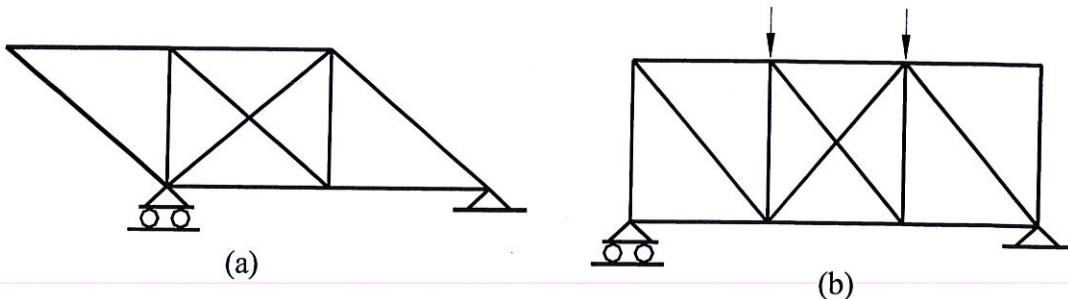


Figure A5/Rajah A5

[4 marks]
[4 markah]

QUESTION 6
SOALAN 6
CLO2
C3

Table A6 shows the solution to determine the internal force in each member of an indeterminate structure.

- i. Calculate the magnitude of coefficient, R
- ii. Calculate the actual force, F.

Jadual A6 menunjukkan penyelesaian untuk menentukan daya dalaman setiap anggota bagi struktur tidak boleh tentu statik.

- i. *Kirakan nilai pekali, R*
- ii. *Kirakan daya sebenar, F.*

[4 marks]
[4 markah]

Table A6/ Jadual A6

Member	L(m)	P _O (kN)	μ	$\mu P_O L$	$\mu^2 L$	F=P _O + μR
AB	5	50	0	0	0	
AE	4	-40	0	0	0	
BC	4	0	-0.8	0	2.56	
BD	5	50	1	-250	5	
BE	3	0	-0.6	0	1.08	
CD	3	-120	-0.6	216	1.08	
CE	5	0	1	0	5	
DE	4	-40	-0.8	128	2.56	

QUESTION 7
SOALAN 7

- CLO 1 C1 Draw the influence line reaction force diagram of support B for beam as shown in **Figure A7**.

Lakarkan gambarajah garis imbas daya tindakbalas di penyokong B bagi rasuk seperti yang ditunjukkan **Rajah A7**.

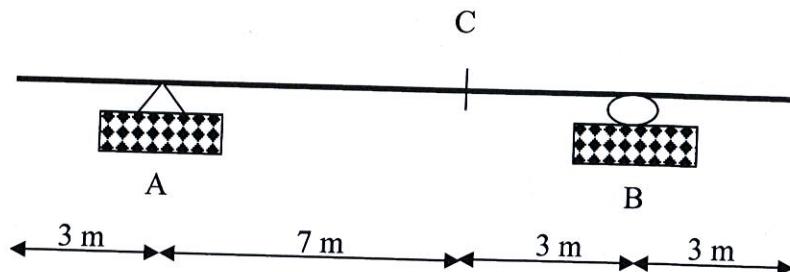


Figure A7 / Rajah A7

[4 marks]
[4 markah]

QUESTION 8
SOALAN 8

- CLO1
C2 Calculate the positive shear that can be developed at point C for the beam shown in **Figure A8** due to concentrated load of 4kN and uniform load of 2kN/m.

Kirakan rincian positif yang berlaku pada titik C seperti ditunjukkan dalam **Rajah A8** apabila dikenakan beban tumpu sebanyak 4kN dan beban teragih seragam sebanyak 2kN/m.

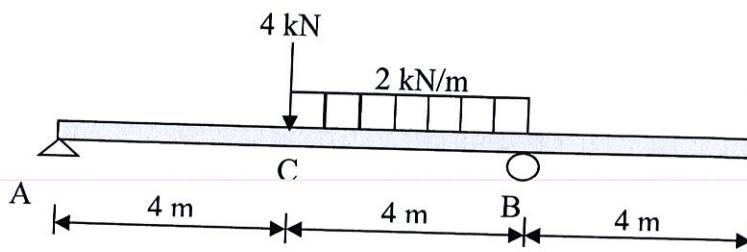


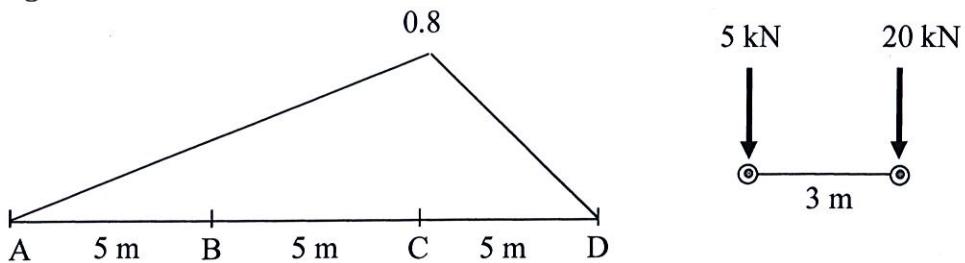
Figure A8/Rajah A8

[4 marks]
[4 markah]

QUESTION 9
SOALAN 9
CLO1
C2

Figure A9 shows the influence line diagram for a member of truss. Calculate the maximum tension force in the member due to the moving load series.

Rajah A9 menunjukkan gambarajah garis imbas bagi satu anggota kekuda. Kirakan daya tegangan maksimum dalam anggota tersebut yang disebabkan oleh satu siri beban yang bergerak.

**Figure A9 / Rajah A9**

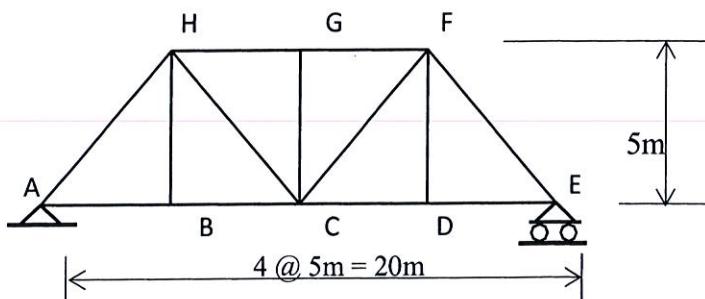
[4 marks]

[4 markah]

QUESTION 10
SOALAN 10
CLO2
C3

Refer to the truss in **Figure A10**, sketch influence line internal force of CD including the value.

Merujuk kepada kerangka dalam **Rajah A10**, lakarkan garis imbas daya dalaman CD termasuk nilainya.

[4 marks]
[4 markah]**Figure A10 / Rajah A10**

SECTION B : 60 MARKS
BAHAGIAN B : 60 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions only.

ARAHAN:

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **TIGA (3)** soalan sahaja.

QUESTION 1
SOALAN 1

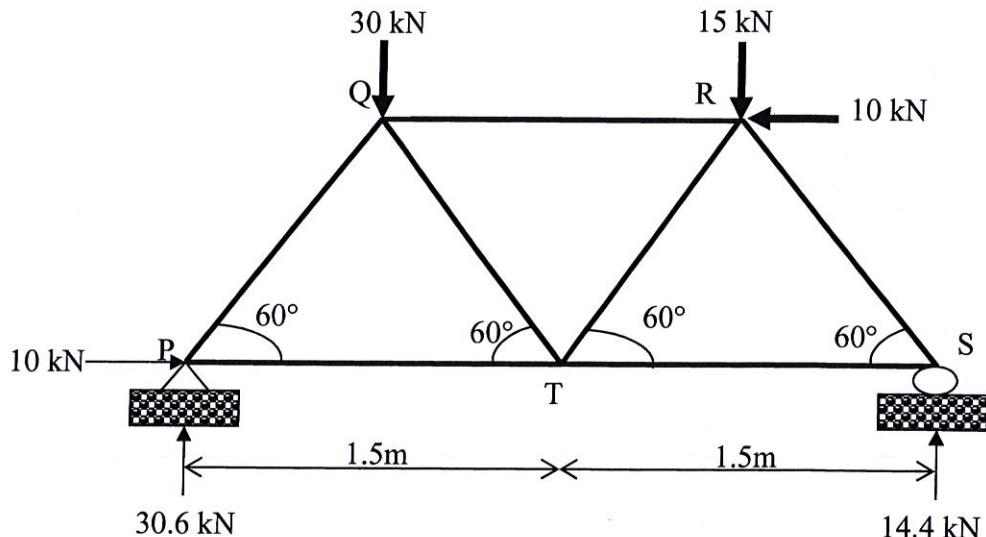


Figure B1 / Rajah B1

A simply supported truss is subjected to a load at joint Q and R as shown in **Figure B1**. Given reaction force at support P, $V_P = 30.6 \text{ kN}$, $H_P = 10 \text{ kN}$ and at support S, $V_S = 14.4 \text{ kN}$. The length of each member is 1.5 meter.

Kekuda disokong mudah seperti yang ditunjukkan pada **Rajah B1** dikenakan beban pada sendi Q dan R. Diberi tindakbalas pada sokong P, $V_P = 30.6 \text{ kN}$, $H_P = 10 \text{ kN}$ dan tindakbalas pada sokong S, $V_S = 14.4 \text{ kN}$. Panjang setiap anggota adalah 1.5 meter.

- CLO 2 C2 (a) Determine the internal force in each member of the truss in which subjected to a point load at joint Q and R by using **Method of Joints**.

Tentukan daya dalaman di setiap anggota bekuda satah apabila dikenakan beban tumpu pada sendi Q dan R dengan menggunakan Kaedah Sendi.

[14 marks]
[14 markah]

- CLO 2 C5 (b) Based on the answer in Question 1(a), produce a diagram of truss by showing forces including sign of force direction.

Berdasarkan kepada jawapan Soalan 1(a), hasilkan gambarajah bekuda dengan menunjukkan daya-daya termasuk tanda arah daya.

[6 marks]
[6 markah]

QUESTION 2
SOALAN 2

Figure B2 shows a frame structure subjected to a horizontal load of 100 kN at joint F and a vertical load of 50 kN at joint C. Given the cross-sectional area of each member, $A = 3000 \text{ mm}^2$ and $E = 205 \text{ kN/mm}^2$

Rajah B2 menunjukkan struktur kekuda dibebani beban ufuk sebanyak 100 kN pada sendi F dan beban pugak sebanyak 50 kN pada sendi C. Diberi luas keratan rentas semua anggota, $A = 3000 \text{ mm}^2$ dan $E = 205 \text{ kN/mm}^2$.

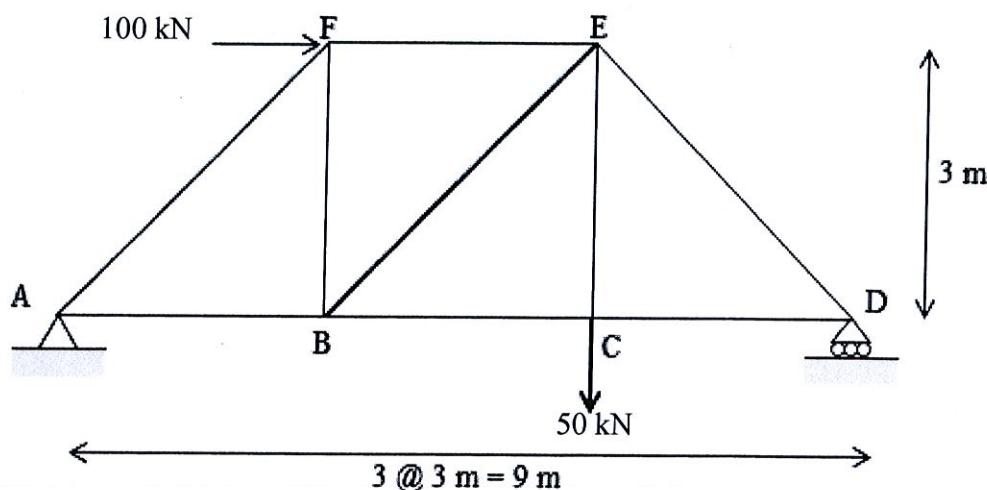


Figure B2 / Rajah B2

- CLO2
C3 a) Calculate the internal force in each member of the truss due to the real loads. Given the reaction forces $A_x = -100 \text{ kN}$, $A_y = -16.67 \text{ kN}$ and $D_y = 66.67 \text{ kN}$.

*Kirakan daya dalaman bagi semua anggota kekuda yang disebabkan daya sebenar.
Diberi daya-daya tindakbalas $A_x = -100 \text{ kN}$, $A_y = -16.67 \text{ kN}$ and $D_y = 66.67 \text{ kN}$.*

[4.5 marks]
[4.5 markah]

- CLO2 b) Determine the internal force in each member of the truss due to a vertical virtual unit load at joint E. Given the reaction forces, $Ay = 0.33$ and $Dy = 0.67$.

Tentukan daya dalaman bagi semua anggota kekuda yang disebabkan satu unit beban pugak pada sendi E. Diberi daya-daya tindakbalas $Ay = 0.33$ and $Dy = 0.67$.

[4.5 marks]
[4.5 markah]

- CLO2 c) From the answer of the internal forces due to real loads and virtual loads, determine the vertical displacement of joint E.

Daripada jawapan nilai daya dalaman yang disebabkan oleh beban sebenar dan beban unit pugak, tentukan anjakan pugak pada sendi E.

[11 marks]
[11 markah]

QUESTION 3
SOALAN 3

A simply supported truss is subjected to a horizontal axial load as shown in **Figure B3**. Given reaction at joint A, $V_A = 10 \text{ kN}$ and reaction at joint B, $V_B = 20 \text{ kN}$ and $H_A = 0 \text{ kN}$. Given cross sectional area, A and modulus elasticity, E are constant in each member of truss.

Kekuda disokong mudah dikenakan beban tumpu mengufuk seperti ditunjukkan dalam Rajah B3. Diberi daya tindakbalas pada sendi A, $V_A = 10 \text{ kN}$ dan daya tindakbalas pada sendi B, $V_B = 20 \text{ kN}$ dan $H_A = 0 \text{ kN}$. Diberi luas keratan rentass, A dan modulus keanjalan, E adalah malar bagi setiap anggota kekuda.

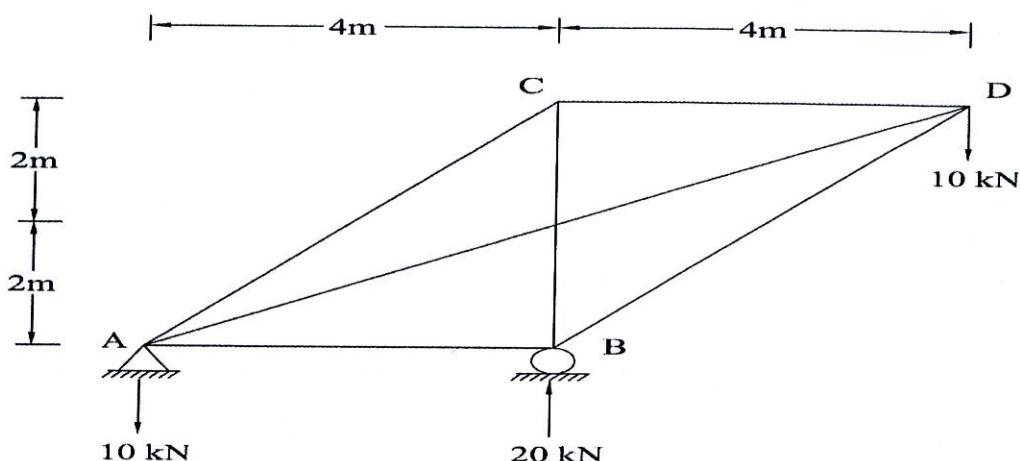


Figure B3 / Rajah B3

CLO1
C2

- a) Compute the forces in all members of the truss with AD member as a redundant.

Pilih anggota AD sebagai lelebih. Kemudian, kirakan daya dalaman bagi setiap anggota kekuda.

[5 marks]
[5 markah]

- CLO1
C4 b) Calculate the forces in all members due to the internal virtual unit force at AD member.

Kirakan daya dalaman bagi semua anggota kekuda disebabkan oleh beban unit di anggota AD .

[5 marks]
[5 markah]

- CLO2
C5 c) Rearrange the forces value by developing a table to determine member of redundant, R.

Susun semula nilai daya dengan membangunkan jadual untuk menentukan anggota lelebih, R.

[7 marks]
[7 markah]

- CLO2
C5 d) Produce the actual force in all members of the truss by using the member of redundant, R.

Hasilkan daya dalaman bagi semua anggota kekuda dengan menggunakan anggota lelebih, R.

[3 marks]
[3 markah]

QUESTION 4
SOALAN 4

A 20m length of simply supported beam carry a series of four moving concentrated loads as shown in **Figure B4**.

Rasuk disokong mudah dengan 20m panjang rentang membawa satu siri beban tumpu seperti yang ditunjukkan dalam Rajah B4.

- | | | |
|------------|---|-------------------------------|
| CLO2
C2 | a) Calculate the resultant force of the load series.
<i>Kirakan daya paduan bagi satu siri beban tumpu.</i> |
[1 mark]
[1 markah] |
| CLO2
C2 | b) Compute the location of the resultant force from point P.
<i>Tentukan kedudukan daya paduan.</i> |
[2 marks]
[2 markah] |
| CLO2
C4 | c) Calculate the absolute maximum moment due to the moving concentrated load series.
<i>Tentukan momen maksima mutlak yang disebabkan oleh satu siri beban tumpu.</i> |
[15 marks]
[15 markah] |
| CLO2
C5 | d) Based on the answer in Question 4(c), explain the importance of absolute maximum moment.
<i>Berdasarkan kepada jawapan Soalan 4(c), terangkan kepentingan momen maksima mutlak.</i> |
[2 marks]
[2 markah] |

20kN 50kN 30kN 20kN

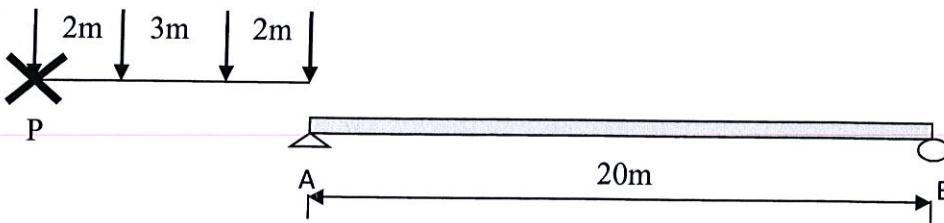


Figure B4 / Rajah B4

SOALAN TAMAT

