SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI DISEMBER 2016

CC601 : STRUCTURAL ANALYSIS 2

TARIKH : 01 APRIL 2017
TEMPOH : 2.30 PM – 4.30 PM (2 JAM)

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

Bahagian A: Soalan Pendek (10 soalan)
Bahagian B: Soalan Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A : 40 MARKS

BAHAGIAN A : 40 MARKAH

INSTRUCTION:

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

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO1
C1

State the **TWO (2)** methods which was used to calculate internal force for truss structure.

*Nyatakan **DUA (2)** kaedah yang digunakan untuk mengira daya dalaman bagi struktur kekuda.*

[4 marks]

[4 markah]

CLO1
C2

QUESTION 2

SOALAN 2

By referring to the **Figure A2**, state the sign convention for tension or compression force for AB, AD, BC & BD members.

*Merujuk kepada **Rajah A2**, nyatakan tanda arah bagi daya tegangan dan mampatan bagi anggota AB, AD, BC dan BD.*

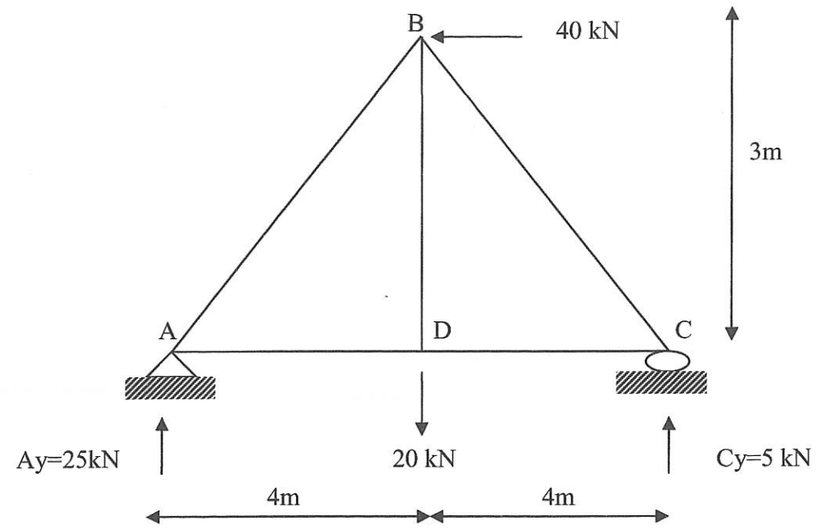


Figure A2 / *Rajah A2*

[4 marks]

[4 markah]

QUESTION 3

SOALAN 3

CLO1
C1

State any **TWO (2)** factors of truss structure displacement.

*Nyatakan mana-mana **DUA (2)** faktor anjakan struktur kekuda.*

[4 marks]

[*4 markah*]

QUESTION 4

SOALAN 4

CLO2
C2

Calculate vertical deflection at joints D due to changes in temperature of 20 °C in member BC and BD, as shown in **Figure A4**. Given the linear expansion coefficient, c = 12 x 10^{-6} /°C.

*Kirakan anjakan pugak di sendi D akibat perubahan suhu sebanyak 20 °C pada ahli BC dan BD seperti yang ditunjukkan dalam **Rajah A4**. Diberi pekali pengembangan linear, c = 12 x 10^{-6}/°C.*

Figure A4 / *Rajah A4*

[4 marks]

[*4 markah*]

QUESTION 5
SOALAN 5

CLO1
C2

Compute the degree of indeterminacy of the trusses shown in **Figure A5** below.
*Kirakan darjah tidak boleh statik bagi kekuda seperti **Rajah A5** di bawah.*

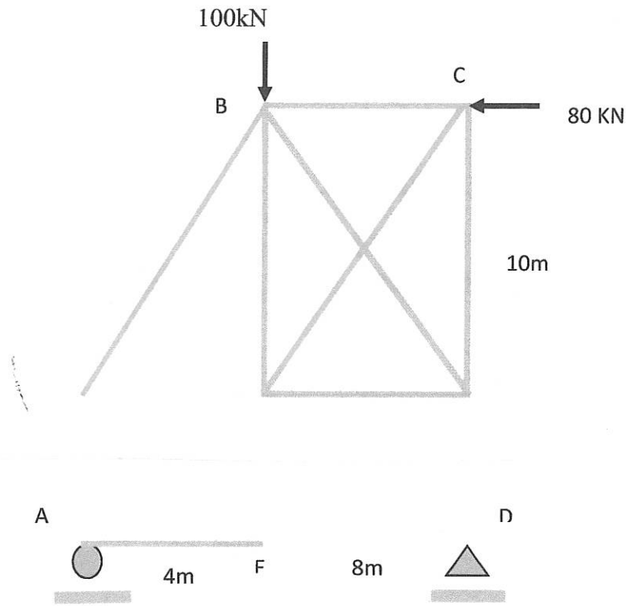


Figure A5 / Rajah A5

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

i. Calculate the magnitude of coefficient, R
Kirakan nilai pekali, R

[2 marks]
[*2 markah*]

ii. Calculate the actual force, F
Kirakan daya sebenar, F

[2 marks]
[*2 markah*]

Table A6 / Jadual A6

Member	L (m)	Po (kN)	μ	μ PoL	μ^2L	F=Po + 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

CLO1
C2

Describe absolute maximum moment.

Takrifkan momen maksima mutlak.

[4 marks]

[4 markah]

QUESTION 8

SOALAN 8

CLO1
C2

A simply supported beam subjected to a series of loads is shown in **Figure A8**.

*Satu rasuk sokong mudah dikenakan beban siri seperti ditunjukkan dalam **Rajah A8.***

a) Compute the resultant force of the load series.

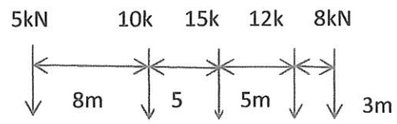
Kirakan daya paduan bagi satu beban siri [2 marks]

[*2 markah*]

b) Calculate the location of the resultant force.

Kirakan kedudukan daya paduan [2 marks]

[*2 markah*]



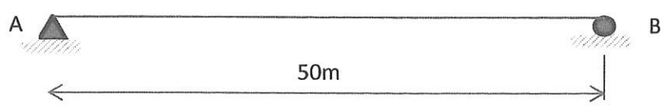


Figure A8 / *Rajah A8*

QUESTION 9

SOALAN 9

CLO1
C3

Figure A9 shows the influence line diagram for member of statically determinate truss. Calculate the maximum tension force for the member when 15kN point load and 10m of 10kN/m uniform distributed load move along the truss.

***Rajah A9** menunjukkan rajah garis imbas untuk kerangka bolehtentu statik.Kirakan daya tegangan maksima dalam anggota tersebut bila beban titik 15kN dan beban teragih seragam 10kN/m yang panjangnya 10m bergerak melalui kerangka tersebut.*

[4 marks]

[4 markah]

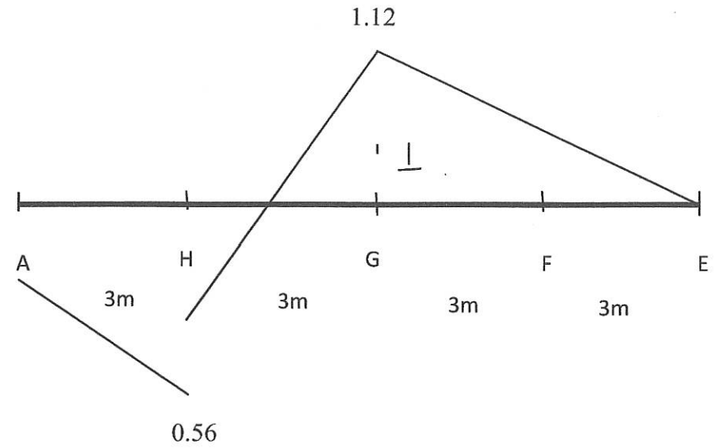


Figure A9/*Rajah A9*

QUESTION 10

SOALAN 10

CLO1
C3

By referring to **Figure A10**, draw the influence line for the vertical reaction at support A.

*Merujuk kepada **Rajah A10**, lukiskan garis imbas bagi tindak balas pada titik A.*

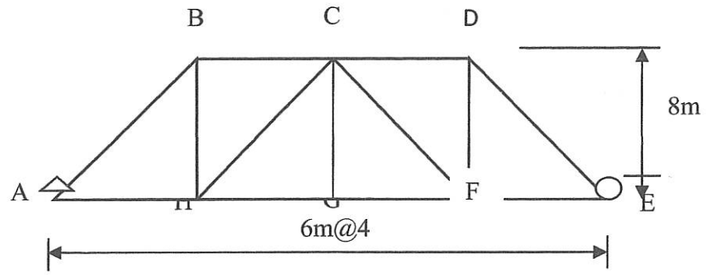


Figure A10/*Rajah A10*

[4 marks]

[4 markah]

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 is a statically determinate truss which supported load as shown.

***Rajah B1** adalah satu kekuda boleh tentu statik yang menanggung beban seperti yang ditunjukkan.*

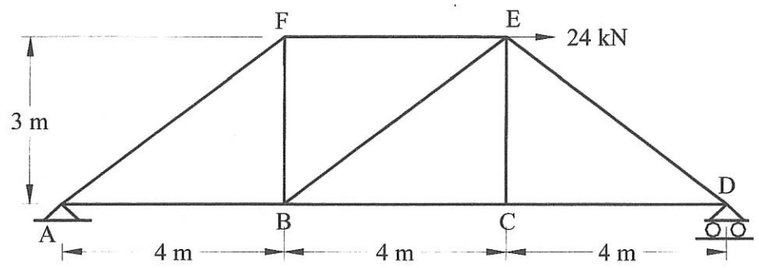


Figure B1 / *Rajah B1*

CLO1
C3

(a) Calculate reaction forces at A and D, then find out zero bar members

Kirakan daya tindakbalas di A dan D, kemudian kenalpasti anggota zero bar

[6 marks]

[6 markah]

CLO2
C4

(b) By using method of joint, calculate internal forces of all members.

Dengan menggunakan kaedah sendi, kirakan daya dalaman semua anggota.

[9 marks]

[9 markah]

CLO2 C5

(c) Sketch the truss with showing all the forces and direction of forces sign.
Lukiskan kerangka dengan menunjukkan semua daya dan simbul arah daya.

[5 marks]
[5 markah]

QUESTION 2
SOALAN 2

Figure 2B shows a statically determinate truss subjected to a vertical load at D. Members of the truss has cross-sectional area for compression members , Ac = 15 cm^2 and cross-sectional area for tension members , At = 12 cm^2 and E = 210 kN/mm^2.
Rajah 2B *menunjukkan kekuda boleh tentu statik yang terdapat beban pugak di sendi D. Nilai luas keratan rentas bagi anggota mampatan, Ac = 15* cm^2 dan anggota tegangan, At = 12 cm^2 dan nilai E = 210 kN/mm^2.

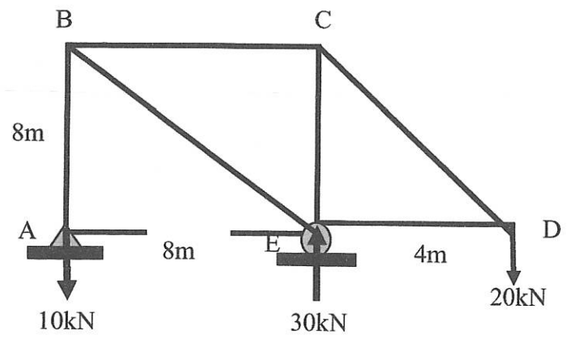


Figure B2/ *Rajah B2*

CLO2 C3

a) Calculate the internal force in each member due to external load.
Kirakan daya dalaman bagi setiap anggota kerangka disebabkan oleh beban luaran.

[6 marks]
[6 *markah*]

CLO2 C3

b) Calculate the internal force in each member due to unit load horizontally at D.
Kirakan daya dalaman bagi setiap anggota kerangka disebabkan oleh beban unit ufuk di titik D.

[6 marks]
[6 *markah*]

CLO2 C5

c) Calculate vertical displacement at joint D.
Kirakan anjakkan pugak pada sendi D.

[8 marks]
[*8 markah*]

QUESTION 3
SOALAN 3

A truss subjected an axial load as shown in **Figure B3**. Given cross sectional area member in compression is A= 1300mm^2 and member in tension is A=1400mm^2. Assume Modulus Elasticity is E= 207kN/mm^2.
Satu kerangka kekuda dikenakan beban tumpu seperti ditunjukkan dalam ***Rajah B3****. Diberi luas keratan rentas bagi anggota mampatan adalah A=1300* mm^2 *dan anggota tegangan adalah A=1400*mm^2*. Andaikan Modulus keanjalan adalah E= 207*kN/mm^2.

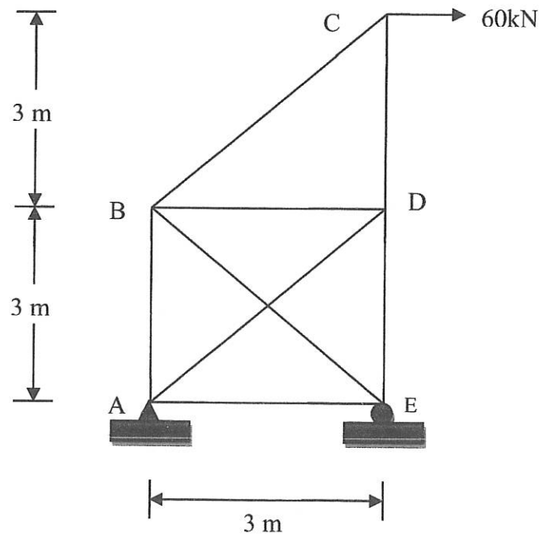


Figure B3/*Rajah B3*

(CLO1 C2)

a) Proof the truss as the indeterminate structure.
Buktikan kekuda adalah boleh tentu statik.

[2 Marks]
[2 Markah]

(CLO1 C4)

b) Analyze the force in each member of truss.
Analisiskan daya dalaman setiap anggota.

[8 Marks]
[8 Markah]

(CLO1 C4)

c) Analyze the force in each member of truss due to the internal virtual unit load.
Analisiskan daya dalaman setiap anggota akibat daripada beban unit luaran.

[6 Marks]
[6 Markah]

(CLO2 C5)

d) Produce all the forces in each member of truss in the diagram.
Hasilkan semua daya dalaman bagi setiap anggota kekuda pada rajah.

[4 Marks]
[4 Markah]

QUESTION 4
SOALAN 4

A simply supported beam of 18 m span is subjected to a series of loads as shown in **Figure B4.**
*Satu rasuk disokong mudah sepanjang 18 m dikenakan satu siri beban seperti ditunjukkan dalam **Rajah B4**.*

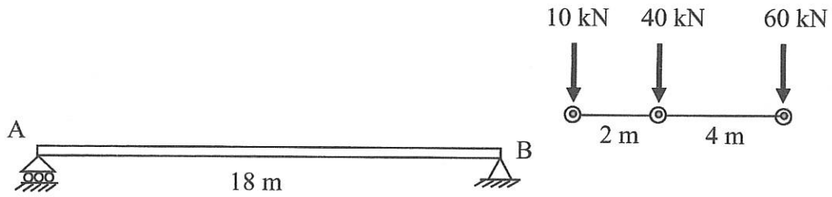


Figure B4/*Rajah B4*

CLO1 C3

a) Calculate the resultant force of the load series and the location of the resultant force.
Kirakan daya paduan bagi satu siri beban dan lokasi daya paduan.

[5 mark]
[*5 markah*]

CLO2 C5

b) Produce the absolute maximum moment by using influence line diagram.
Hasilkan momen maksimum mutlak dengan menggunakan gambarajah garis imbas.

[15 marks]
[*15 markah*]

SOALAN TAMAT