

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR
SESI DISEMBER 2015

CC601: STRUCTURAL ANALYSIS 2

TARIKH : 04 APRIL 2016
MASA : 11.15 AM - 1.15 PM (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.
Bahagian A: Soalan Pendek (10 soalan)
Bahagian B: Struktur (4 soalan)
Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI 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 State any **TWO (2)** methods which are used to calculate the internal forces of truss structure.

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

[4 marks]

[4 markah]

QUESTION 2

SOALAN 2

CLO1
C2 By referring to **Figure A2**, calculate the reaction at support A and C.

Merujuk kepada **Rajah A2**, kirakan tindak balas pada penyokong A dan C.

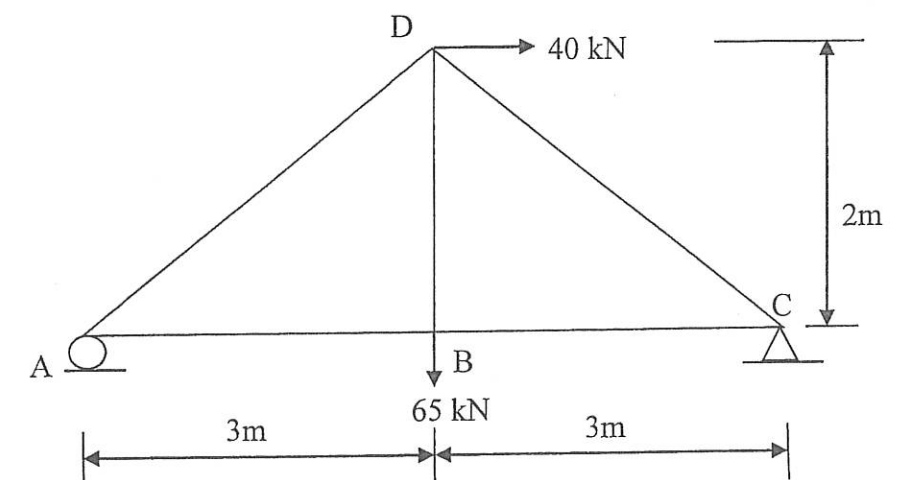


Figure A2/Rajah A2

[4 marks]

[4 markah]

QUESTION 3
SOALAN 3

CLO1
C2

Identify **TWO (2)** factors for displacement in structures
Kenalpasti DUA (2) faktor yang menyebabkan anjakan dalam struktur.

[4 marks]
[4 markah]

QUESTION 4
SOALAN 4

CLO2
C2

By referring to **Figure A4**, calculate the vertical displacement of joint C, caused by the increase in length of 3mm for AB and BC members while 5mm for CA member.
Merujuk kepada Rajah A4, kirakan anjakan pugak pada sendi C yang disebabkan oleh perubahan terhadap pemanjangan sebanyak 3mm pada anggota AB dan BC manakala 5mm pada anggota CA.

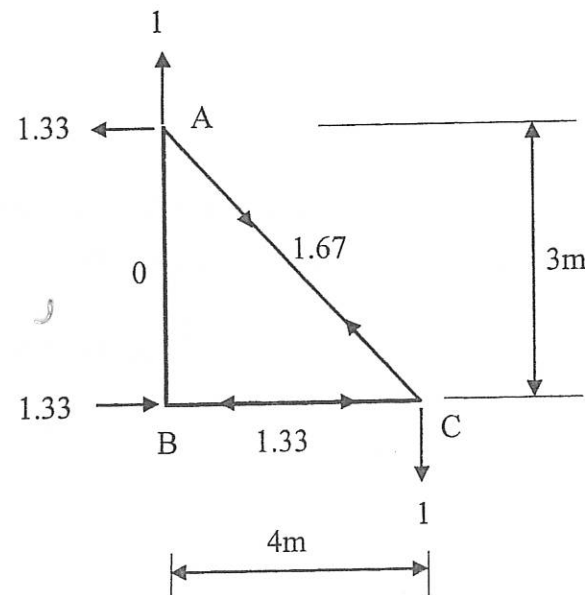


Figure A4/Rajah A4

[4 marks]
[4 markah]

QUESTION 5
SOALAN 5

CLO1
C2

By referring to **Figure A5 (a) and (b)**, classify whether the truss is internally indeterminate structures, externally indeterminate structure or a combination of both.
Merujuk kepada Rajah A5 (a) dan (b), kelaskan sama ada kekuda mempunyai kelebihan dalaman, luaran atau gabungan antara keduanya.

[4 marks]

[4 markah]

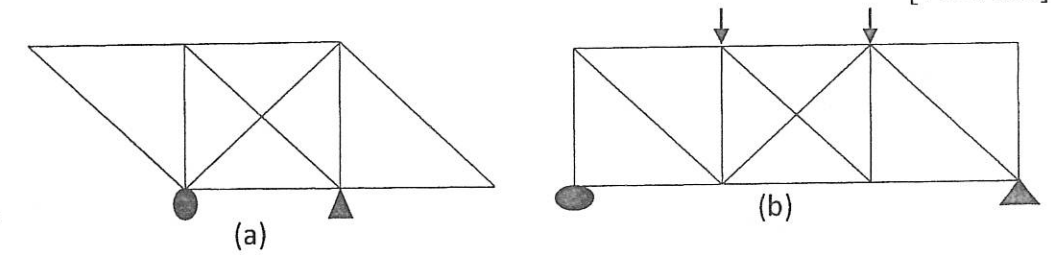


Figure A5 / Rajah A5

QUESTION 6
SOALAN 6

CLO1
C3

Calculate the forces for each member of indeterminate truss as shown in **Figure A6** due to the internal virtual unit load. Assume AC as a redundant.
Kirakan daya pada setiap anggota kekuda tidak boleh tentu statik seperti ditunjukkan dalam Rajah A6 disebabkan oleh beban unit maya. Anggap AC adalah anggota lebih.

[4 marks]

[4 markah]

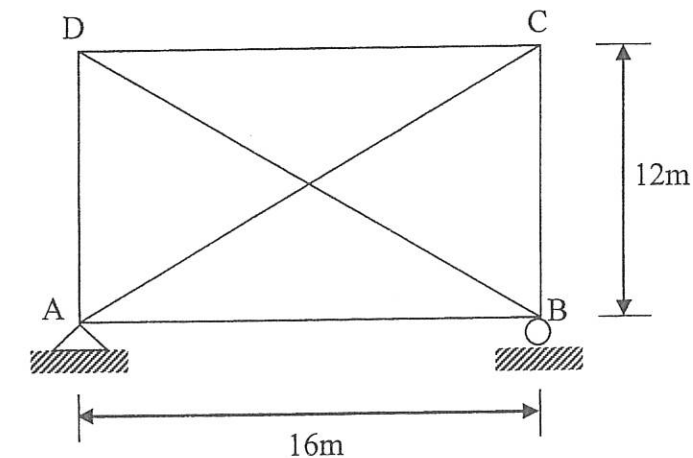


Figure A6 / Rajah A6

SULIT

QUESTION 7
SOALAN 7

CLO1
C1

Define absolute maximum moment.
Takrifkan momen maksima mutlak.

[4 marks]
[4 markah]

QUESTION 8
SOALAN 8

CLO1
C2

A series of concentrated loads moving on 20 m simply supported beam as shown in **Figure A8**. Calculate the location of the resultant force.

*Satu sistem beban titik bergerak melalui rasuk terletak mudah 20m seperti **Rajah A8**. Kirakan kedudukan daya paduan.*

[4 marks]
[4 markah]

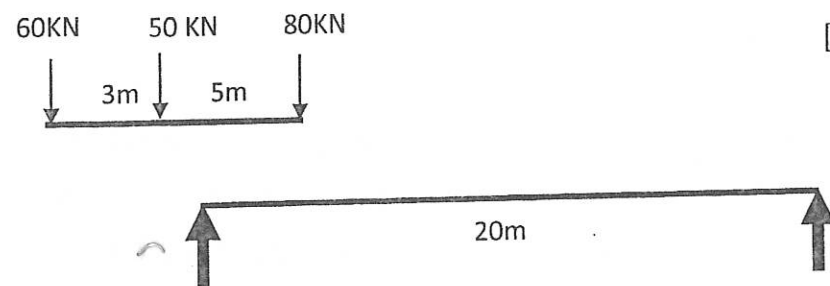


Figure A8/ *Rajah A8*

SULIT

QUESTION 9
SOALAN 9

CLO1
C2

Figure A9 shows the influence line diagram for a statically determinate truss member. Calculate the maximum tension and maximum compression forces for the member when 20kN point load and 15kN/m uniform distributed load of 10m move along the truss.

***Rajah A9** menunjukkan gambarajah garis imbas untuk suatu anggota kerangka statik boleh tentu. Kirakan daya tegangan dan daya mampatan maksimum anggota bila beban tumpu 20kN dan beban teragih seragam 15kN/m dengan panjang 10m bergerak merentasi kerangka tersebut.*

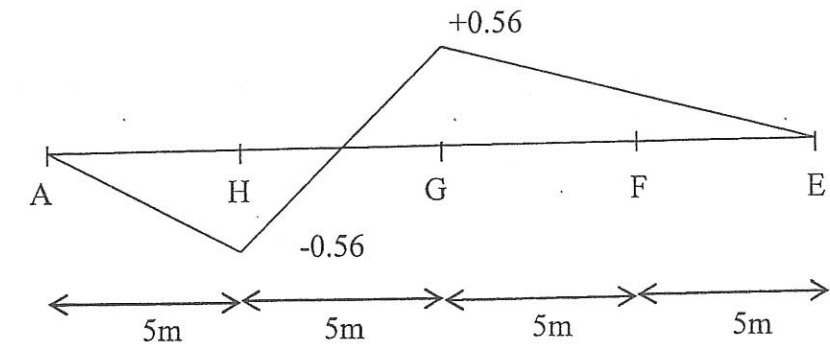


Figure A9 / *Rajah A9*

[4 marks]
[4 markah]

QUESTION 10

SOALAN 10

CLO1
C3

Figure A10 shows the influence line diagram for a member of truss. Calculate maximum tension force due to the concentrated load of 50 kN and uniformly distributed load of 100 kN/m along the span.

Rajah A10 menunjukkan gambarajah garis imbas bagi satu anggota kekuda. Kirakan daya tegangan maksimum yang disebabkan oleh satu beban tumpu bernilai 50 kN dan beban teragih seragam 100 kN/m di sepanjang rentang.

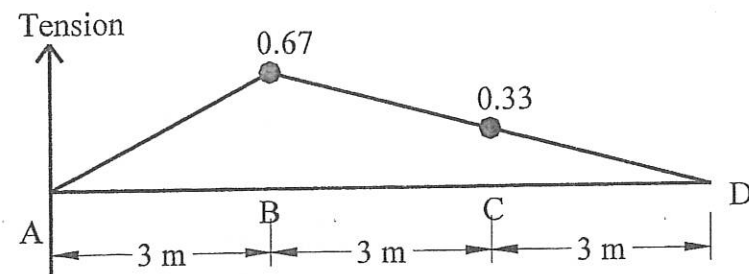


Figure A10 / Rajah A10

[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

A pin-jointed truss is subjected to vertical and horizontal loads as shown in Figure B1. Satu kekuda sambungan pin dikenakan beban-beban pugak dan ufuk seperti ditunjukkan dalam Rajah B1.

- CLO1
C2 a) Determine the reaction forces at supports A and E.
Tentukan daya-tindakbalas pada tupang A dan E.

[4 marks]

[4 markah]

- CLO1
C4 b) Calculate the internal force in each member by using the method of joint equilibrium.
Kirakan daya-daya dalaman setiap anggota dengan menggunakan kaedah keseimbangan titik sambungan.

[11 marks]

[11 markah]

- CLO1
C5 c) Based on the answers in (b), build a truss diagram by showing all member forces in the truss.
Berdasarkan jawapan dalam (b), bina satu gambarajah kekuda menunjukkan semua daya-daya ahli.

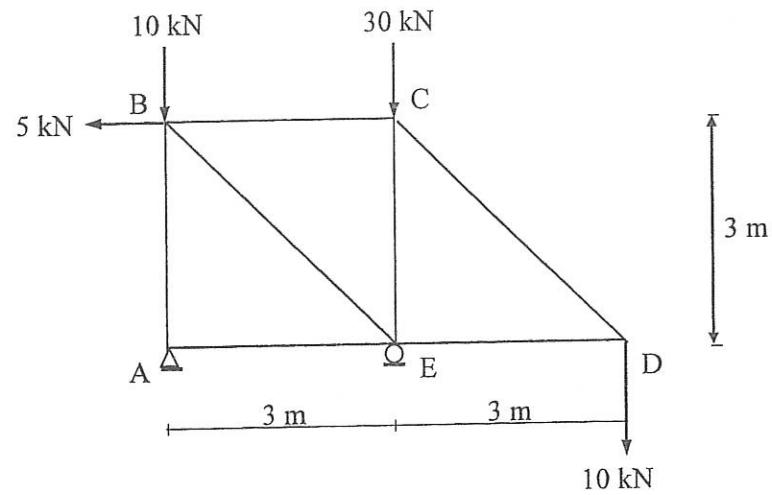


Figure B1 / Rajah B1

[5 marks]

[5 markah]

QUESTION 2

SOALAN 2

Figure B2 is statically determinate truss which supported load as shown. Given the cross sectional area, $A = 1000 \text{ mm}^2$ and modulus elasticity, $E = 200 \text{ kN/mm}^2$ for each member.

Rajah B2 adalah satu kekuda boleh tentu statik yang menanggung beban seperti yang ditunjukkan. Diberi luas keratan rentas, $A = 1000 \text{ mm}^2$ dan modulus keanjalan, $E = 200 \text{ kN/mm}^2$ bagi setiap ahli.

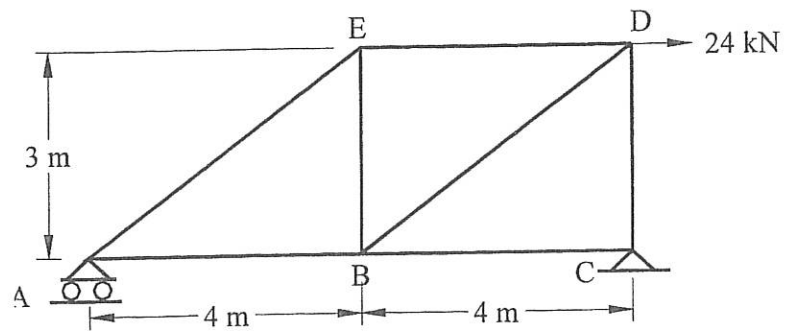


Figure B2 / Rajah B2

CLO2
C3

(a) Compute the internal force in each member due to real external loads.

Kirakan daya dalaman bagi setiap ahli kerangka disebabkan beban sebenar.

[7 marks]

[7 markah]

CLO2
C4

(b) Calculate the internal force in each member due to the horizontal virtual unit load at D.

Kirakan daya dalaman bagi setiap ahli kerangka disebabkan beban unit maya ufuk di D.

[7 marks]

[7 markah]

CLO2
C5

(c) Evaluate the horizontal displacement of joint D.

Dapatkan nilai anjakan ufuk di sendi D.

[6 marks]

[6 markah]

QUESTION 3

SOALAN 3

A truss is subjected to horizontal axial load at joint D as shown in Figure B3. Assume that member BD as a redundant. The cross sectional area (A) and modulus elasticity (E) are constant in each member of the truss.

Sebuah kekuda dikenakan beban ufuk pada sambungan D seperti ditunjukkan dalam Rajah B3. Anggota BD dianggap sebagai lebih. Luas keratan rentas anggota (A) dan modulus keanjalan (E) adalah malar pada setiap anggota kekuda.

CLO2
C3

(a) Calculate the reaction at support A and B.

Kirakan tindakbalas pada penyokong A dan B.

[3 marks]

[3 markah]

CLO2
C4 (b) Calculate the internal forces in all members of the truss due to BD member as a redundant.

Kirakan nilai daya dalaman bagi anggota struktur kekuda dengan mengambil kira anggota BD sebagai lebih.

[5 marks]
[5 markah]

CLO2
C4 (c) Calculate the internal forces in all members of the truss due to internal virtual unit force at BD member.

Kirakan nilai daya dalaman anggota bagi struktur kekuda yang disebabkan oleh beban unit pada anggota lebih BD.

[5 marks]
[5 markah]

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

Susun semula nilai daya dengan membina jadual untuk menentukan nilai anggota lebih, R.

[4 marks]
[4 markah]

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

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

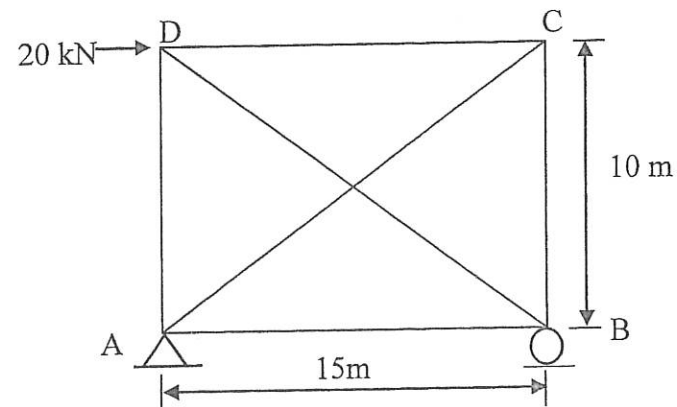


Figure B3 / Rajah B3

[3 marks]
[3 markah]

QUESTION 4
SOALAN 4

A 20m long simply supported beam carries 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.

CLO1
C2 a) Calculate the resultant force of the concentrated load series
Kirakan daya paduan bagi satu siri beban tumpu

[2 mark]
[2 markah]

CLO1
C2 b) Calculate the location of the resultant force
Kirakan kedudukan daya paduan

[3 marks]
[3 markah]

CLO1
C4 c) Determine the absolute maximum moment due to the concentrated load
Tentukan nilai momen maksima mutlak disebabkan oleh satu siri beban tumpu

[15 marks]
[15 markah]

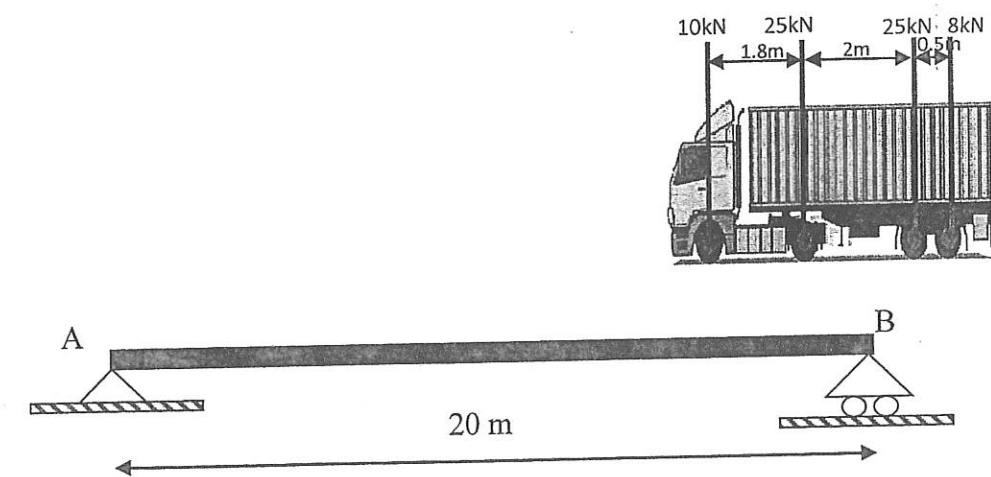


Figure B4 / Rajah B4

SOALAN TAMAT