

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN AWAM

**PEPERIKSAAN AKHIR
SESI DISEMBER 2016**

DCB5182 : INTRODUCTION TO STRUCTURES

**TARIKH : 07 APRIL 2017
MASA : 8.30 AM - 10.30 AM (2 JAM)**

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Bahagian A: Struktur (2 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 : 50 MARKS

BAHAGIAN A : 50 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** structured essay questions. Answers **ALL** questions.

ARAHAN :

Bahagian ini mengandungi **DUA (2)** soalan esei berstruktur. Jawab **SEMUA** soalan.

QUESTION 1

SOALAN 1

- CLO1
C1 (a) Identify **FIVE (5)** factors that influence the strength of wood.
Kenalpasti LIMA (5) faktor yang mempengaruhi kekuatan kayu. [5 marks]
[5markah]
- CLO1
C3 (b) Sketch and label the following types of framework structural system:
Lakarkan dan labelkan jenis-jenis sistem struktur kerangka yang berikut:
- i. Column
Tiang
 - ii. Beam
Rasuk
 - iii. Cantilever
Julur
 - iv. Truss
Kekuda
- [8 marks]
[8 markah]
- CLO1
C3 (c) i. Interpret **THREE (3)** types of load.
Tafsirkan TIGA (3) jenis beban. [6 marks]
[6 markah]
- ii. Sketch **THREE (3)** types of support.
Lakarkan TIGA (3) jenis penyokong. [6 marks]
[6 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- (a) Define shear force and bending moment in a beam.

Definisikan daya ricih dan momen lentur di dalam sebatang rasuk.

[5 marks]

[5 markah]

CLO1
C3

- (b) A hollow steel tube 3.0m long, has an external diameter of 130 mm. In order to determine the internal diameter, the tube was subjected to a tensile load of 400 kN and the extension was 3 mm. If the modulus of elasticity for the tube material is 200 GPa, calculate the internal diameter of the tube.

Sebatang tiub berongga, 3.0 m panjang mempunyai 130 mm garispusat luar. Untuk mendapatkan garispusat dalam, tiub itu dikenakan beban tegangan sebanyak 400 kN, dan pemanjangan tiub itu didapati sebanyak 3 mm. Jika modulus keanjalan tiub tersebut adalah 200 GPa, kirakan garispusat dalam tiub tersebut.

[8 marks]

[8 markah]

CLO1
C3

- (c) A simply supported beam with a span of 2.5 m is subjected to a uniformly distributed load and moment as shown in Figure 1.

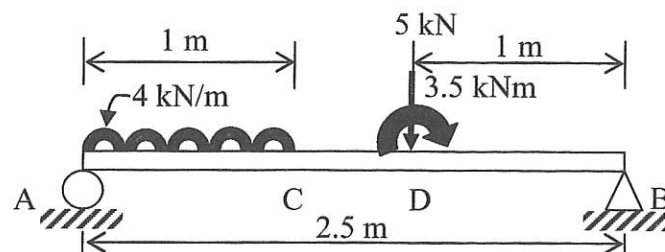
Sebuah rasuk yang ditupang mudah 2.5 m panjang, menanggung beban teragih seragam dan momen seperti yang ditunjukkan dalam Rajah 1.

Figure 1 / Rajah 1

- i. Calculate the reaction for the beam at support A and B.

Kirakan daya tindakbalas di penyokong A dan B bagi rasuk tersebut.

[4 marks]

[4 markah]

- ii. Calculate the shear force value at points A, C, D and B. [4 marks]

Kirakan nilai daya ricih pada titik A, C, D dan B.

[4 markah]

- iii. Based on the answer in question 2(c)(ii), draw the shear force diagram for the beam.

Merujuk kepada jawapan dari soalan 2(c)(ii), lukiskan gambarajah daya ricih bagi rasuk.

[4 marks]

[4 markah]

SECTION B : 50 MARKS**BAHAGIAN B : 50 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions.

ARAHAN:

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.

QUESTION 1**SOALAN 1**CLO1
C1

- (a) State **FIVE (5)** factors that can affect the strength of concrete used as a structural beam.

Nyatakan LIMA (5) faktor yang boleh mempengaruhi kekuatan konkrit yang digunakan sebagai struktur rasuk.

[5 marks]

[5 markah]

CLO1
C2

- (b) Loads from the beam will be distributed through the column. Describe **TWO (2)** types of loading for the column structure.

Semua bebanan rasuk akan diagihkan melalui tiang. Jelaskan DUA (2) jenis pembebanan bagi struktur tiang.

[8 marks]

[8 markah]

CLO1
C3

- (c) i. List **FOUR (4)** types of external and internal forces. [4 marks]

Senaraikan EMPAT (4) jenis daya luaran dan dalaman. [4 markah]

- ii. Based on the answer in question 1(c)(i), explain each of the external and internal force.

Merujuk kepada jawapan dari soalan 1(c)(i), terangkan keadaan setiap jenis daya luaran dan dalaman.

[4 marks]

[4 markah]

- iii. Based on the answer in question 1(c)(i), sketch the condition for each of the external and internal force.

Merujuk kepada jawapan dari soalan 1(c)(i), lakarkan keadaan setiap jenis daya luaran dan dalaman.

[4 marks]

[4 markah]

QUESTION 2**SOALAN 2**CLO2
C1

- (a) Loads are classified by the way they are distributed on a structure. Define:

Beban dikelaskan dengan cara bagaimana ia diagihkan pada sesuatu struktur.

Takrifkan:

- i. Uniformly distributed loads [2.5 marks]

Beban agihan seragam [2.5 markah]

- ii. Moment [2.5 marks]

Momen [2.5 markah]

CLO2
C2

- (b) During an experiment on a timber specimen with 75 mm x 75 mm in cross-section, a shortening of 0.22 mm was recorded on a gauge length of 300 mm when a load of 36 kN was applied.

Semasa melaksanakan ujikaji ke atas spesimen kayu yang berkeratan rentas 75 mm x 75 mm, pemendekan sebanyak 0.22 mm telah direkodkan pada panjang tolok 300 mm apabila dikenakan daya sebanyak 36 kN.

- i. Calculate the modulus of elasticity (E) of the timber. [4 marks]

Kirakan modulus keanjalan (E) bagi kayu. [4 markah]

- ii. Using this value of E, determine the amount of shortening for a square timber post of 150 mm and 2.4 m height subjected to an axial load of 130 kN.

Dengan menggunakan nilai E ini, tentukan jumlah pemendekan bagi sebuah tiang kayu segiempat sama 150 mm dan 2.4 m tinggi yang dikenakan beban paksi sebanyak 130 kN.

[4 marks]

[4 markah]

CLO2
C3

- (c) An overhang beam with 5.5 m length is subjected to a point load of 20kN and 40 kN as shown in Figure 2. Draw diagrams of the beam to show shear force and bending moment. Given reaction, $B_y = 46\text{kN}$ and $D_y = 14\text{ kN}$.

Satu rasuk hujung tergantung dengan panjang 5.5 m dikenakan beban tumpu 20kN dan 40 kN seperti dalam Rajah 2. Lukiskan gambarajah daya ricih dan momen lentur bagi rasuk. Diberi tindak balas $B_y = 46\text{ kN}$ dan $D_y = 14\text{ kN}$.

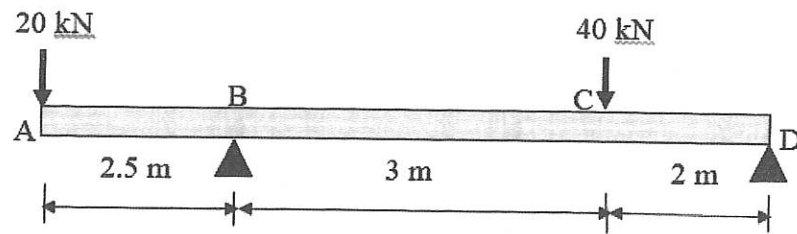


Figure 2 / Rajah 2

[12 marks]
[12 markah]

QUESTION 3
SOALAN 3

CLO2
C1

- (a) Draw FIVE (5) types of beam.
Lukis LIMA (5) jenis rasuk.

[5 marks]
[5 markah]

CLO2
C2

- (b) Figure 3 shows a cantilever beam. Calculate the reaction force at the support and draw the Shear Force Diagram.

Rajah 3 menunjukkan rasuk jular. Kirakan daya tindakbalas di penyokong dan lukiskan Gambarajah Daya Ricih.

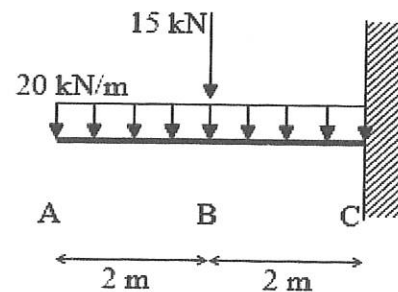


Figure 3 / Rajah 3

[8 marks]
[8 markah]

CLO2
C3

- (c) Figure 4 shows a 10 m simply supported beam subjected to an evenly distributed load of 5 kN/m, point load of 2 kN and 4kN and moment of 2 kN/m along its span. Draw the shear force diagram and bending moment for the beam.

Rajah 4 menunjukkan rasuk sokong mudah 10 m panjang dikenakan beban teragih seragam 5 kN/m, beban tumpu 2 kN dan 4 kN serta momen 2 kN/m di sepanjang rasuk. Lukiskan gambarajah daya ricih dan momen lentur bagi rasuk.

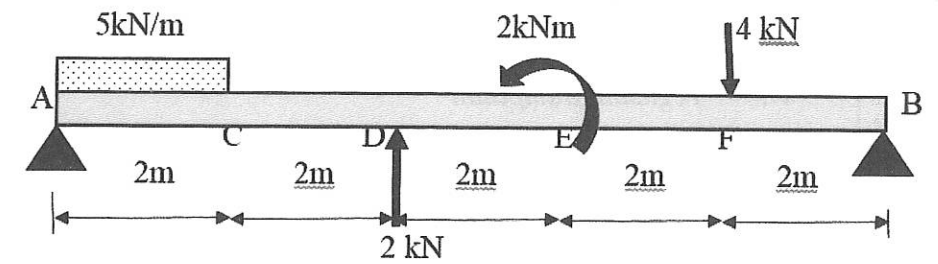


Figure 4 / Rajah 4

[12 marks]
[12 markah]

QUESTION 4
SOALAN 4

CLO2
C1

- (a) Show,

$$E = \frac{PL}{A \delta L}$$

Where, $E = \text{Young's Modulus}$, $A = \text{Cross section area}$
 $P = \text{Load}$, $L = \text{Length}$
 $\delta L = \text{Elongation}$

Tunjukkan bahawa,

$$E = \frac{PL}{A \delta L}$$

Dimana, $E = \text{Modulus Young}$, $A = \text{Luas keratan rentas}$
 $P = \text{Beban}$, $L = \text{Panjang}$
 $\delta L = \text{Pemanjangan}$

[5 marks]
[5 markah]

CLO2
C2

(b) Explain the terms below;

- i. Tensile Strain
- ii. Compressive Strain
- iii. Tensile Stress
- iv. Compressive Stress

Terangkan istilah berikut;

- i. Terikan Tegangan
- ii. Terikan Mampatan
- iii. Tegasan Tegangan
- iv. Tegasan Mampatan

[8 marks]
[8 markah]

CLO2
C3

(c) A tensile test was conducted on a mild steel bar. The following data were obtained from the test;

Diameter of the steel bar	= 3 cm
Length of the bar	= 20 cm
Load at elastic limit	= 250 kN
Extension of the bar at a load of 150 kN	= 0.21 mm
Maximum load	= 380 kN
Total extension	= 60 mm
Diameter of the bar at failure	= 2.2 cm.

Calculate;

- i. Young's modulus [3 marks]
- ii. Stress at elastic limit [3 marks]
- iii. Percentage of elongation [3 marks]
- iv. Percentage of decrease in a section area [3 marks]

Satu ujian tegangan telah dilakukan ke atas sebatang rod keluli. Berikut adalah data-data yang diperolehi dari ujian tersebut;

Diameter rod keluli	= 3 cm
Panjang rod keluli	= 20 cm
Beban pada had elastic	= 250 kN
Pemanjangan rod pada beban 150 kN	= 0.21 mm
Beban maksima	= 380 kN
Jumlah pemanjangan	= 60 mm
Diameter rod ketika gagal	= 2.2 cm

Kirakan;

- i. Modulus Young [3 markah]
- ii. Tegasan pada had elastic [3 markah]
- iii. Peratus pemanjangan [3 markah]
- iv. Peratus pengurangan luas keratan rentas [3 markah]

SOALAN TAMAT