SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI I : 2024/2025

DCQ50222 : PRINCIPLES OF STRUCTURE

TARIKH : 10 DISEMBER 2024
MASA : 2.30 PAGI – 4.30 PETANG (2 JAM)

Kertas soalan ini mengandungi **DUA BELAS (12)** halaman bercetak.
Bahagian A: Subjektif(2 soalan)
Bahagian B: Subjektif(4 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A : 50 MARKS

BAHAGIAN A : 50 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** subjective questions. Answer **ALL** questions.

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO1 (a) A combination of several forces acting on a body is called a force system. With the aid of sketches, differentiate between co-planar forces and non-co-planar forces.

Gabungan beberapa daya yang bertindak ke atas sesuatu objek dipanggil sistem daya. Dengan bantuan lakaran, bezakan antara daya satah sekata dan daya satah tidak sekata.

[6 marks]

[*6 markah*]

CLO1 (b) **Figure A1(b)** shows a free body diagram of concurrent force system. Estimate the magnitude and direction of the resultant force.

***Rajah A1(b)** menunjukkan gambar rajah jasad bebas bagi sistem daya serentak. Anggarkan magnitud dan arah daya paduan.*

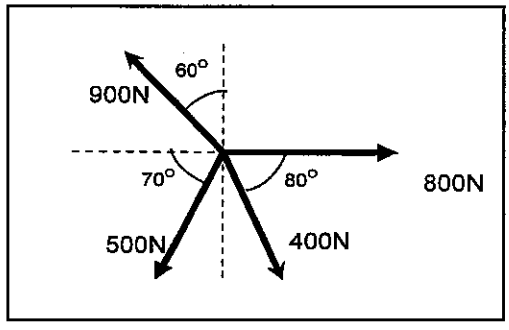

Figure A1(b)/ *Rajah A1(b)*

[9 marks]

[*9 markah*]

CLO1 (c) A beam is a horizontal structural element that primarily resists loads applied laterally to the beam's axis. With the aid of sketches, explain the **THREE (3)** types of beams and their behaviour.

*Rasuk ialah elemen struktur mendatar yang terutamanya menahan beban yang dikenakan secara lateral kepada paksi rasuk. Dengan bantuan lakaran, terangkan **TIGA (3)** jenis rasuk dan kelakuannya.*

[10 marks]
[*10 markah*]

QUESTION 2
SOALAN 2

CLO1 (a) Relationship between stress and strain is known as Hooke's Law. According to **Figure A2(a)**, explain the state of points A, B, and C that are labeled on the stress-strain relationship curve.

*Hubungan antara tegasan dan terikan dikenali sebagai Hukum Hooke. Berdasarkan **Rajah A2(a)**, terangkan keadaan titik A, B, dan C yang dilabelkan pada lengkung hubungan tegasan-terikan.*

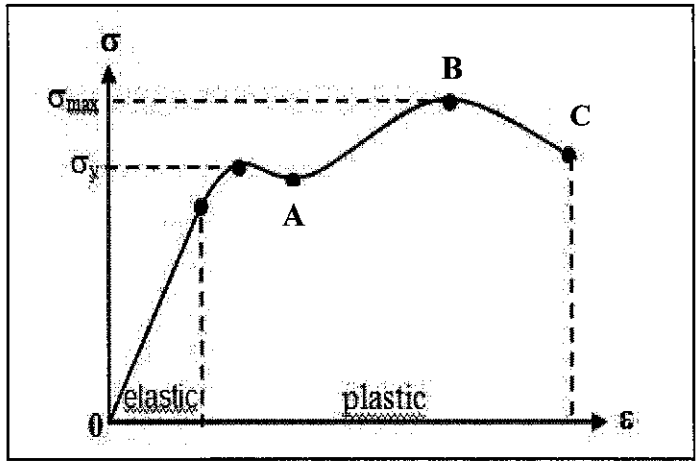

Figure A2(a)/ *Rajah A2(a)*

[6 marks]
[*6 markah*]

CLO1 (b) A rod with a length of 2.5 meters and a cross-sectional area of 1290 mm^2 undergoes an elongation of 1.5 mm when subjected to a tensile force of 142 kN. Identify the value of modulus of elasticity of the rod.

Satu rod 2.5m panjang dengan luas keratan rentasnya 1290mm^2 mengalami pemanjangan 1.5mm apabila dikenakan daya tegangan 142 kN. Kenal pasti nilai modulus keanjalan rod tersebut.

[9 marks]

[9 *markah*]

CLO1 (c) According to **Figure A2(c)**, a composite rod 350 mm long consists of a 250 mm long copper rod with a diameter of 15 mm, rigidly connected to a 100 mm long zinc rod with a diameter of 12 mm. If subjected to a compressive load of 15 kN, estimate the total shortening of the rod.

[E_{copper} = 130 GN/m^2 & E_{zinc} = 100 GN/m^2

*Merujuk kepada **Rajah A2(c)**, satu rod keratan rencam 350mm panjang terdiri dari rod kuprum sepanjang 250mm dan bergarispusat 15mm disambung secara tegar pada sebatang rod zink sepanjang 100mm dengan garispusat 12mm. Sekiranya dikenakan beban mampatan sebanyak 15kN, tentukan jumlah pemendekan bagi rod tersebut.*

[E_{kuprum} = 130 GN/m^2 & E_{zink} = 100 GN/m^2].

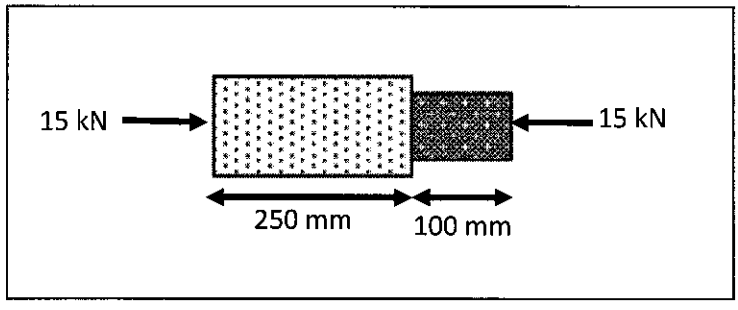

Figure A2(c)/ *Rajah A2(c)*

[10 marks]

[*10 markah*]

SECTION B : 50 MARKS

BAHAGIAN B : 50 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO2 (a) A simply supported beam is supported by a pin and a roller, as shown in Figure B1(a). It carries a uniformly distributed load of 30 kN/m and point loads of 25 kN and a moment of 10 kNm at point D. Determine the reactions at supports A and B with the aid of a free body diagram.

Satu rasuk disokong mudah ditupang secara pin dan rola seperti dalam Rajah B1(a). Rasuk dikenakan beban teragih seragam sebanyak 30 kN/m dan beban titik sebanyak 25 kN serta momen sebanyak 10 kNm di titik D. Tentukan daya tindakbalas pada tupang A dan B dengan bantuan gambarajah jasad bebas.

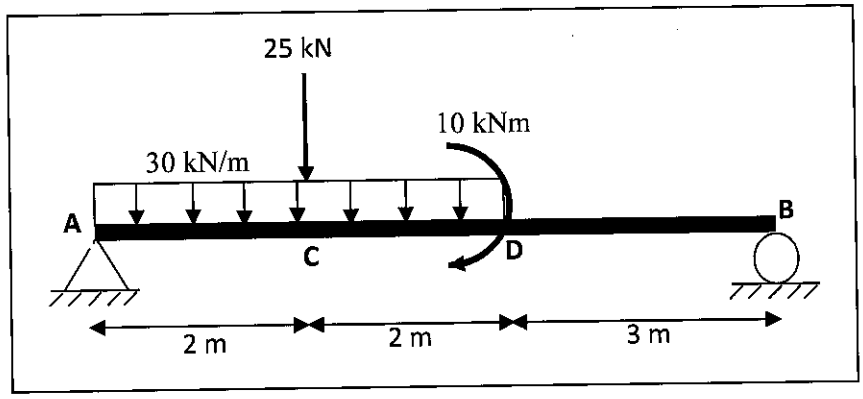

Figure B1(a)/ *Rajah B1(a)*

[10 marks]

[*10 markah*]

CLO2 (b) A cantilever beam with a length of 5 meters is fixed at one end (support A) and free at the other end. The beam supports a uniformly distributed load of 5 kN/m along 3m length and a point load of 10 kN applied 4 meters from the fixed end as shown in **Figure B1(b).** Given the reactions at the fixed end, A, are as follows;

*Rasuk julur dengan panjang 5 meter dipasang pada satu hujung terikat (tupang A) dan bebas di hujung yang satu lagi. Rasuk ini memikul beban teragih seragam sebanyak 5 kN/m sepanjang 3 meter dan beban tumpu sebanyak 10 kN yang dikenakan 4 meter dari hujung terikat seperti yang ditunjukkan dalam **Rajah B1(b)**. Diberikan tindak balas di hujung terikat, A seperti adalah seperti berikut;*

Vertical reaction force, $F_{Ay} = 25$ kN

Daya tindakbalas pugak, $F_{Ay} = 25$ kN

Moment reaction, $M_A = -70.5$ kNm

Daya tindakbalas Momen $M_A = -70.5$ kNm

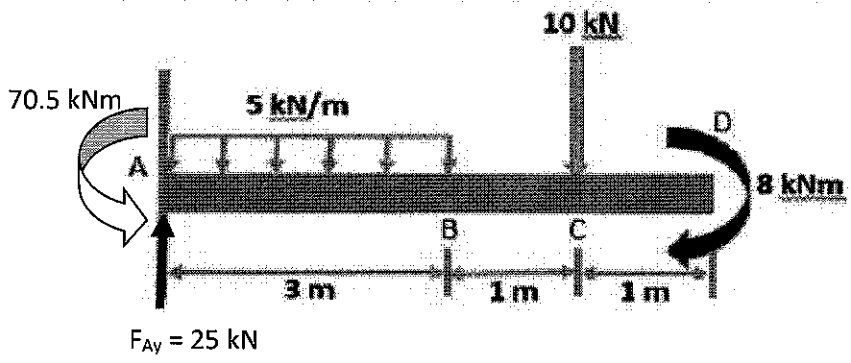

Figure B1(b)/ *Rajah B1(b)*

i. Calculate the value of shear force and bending moment.
Kirakan nilai daya ricih dan momen lentur.

[8 marks]
[*8 markah*]

ii. Sketch the shear force and bending moment diagrams with labels.
Lakarkan gambarajah daya ricih dan momen lentur berserta label.

[7 marks]
[*7 markah*]

QUESTION 2
SOALAN 2

CLO2 (a) An overhanging beam with a length of 14 meters is supported by a pin and a roller, as shown in **Figure B2(a)**. It carries a uniformly distributed load of 25 kN/m and point loads of 50 kN at points C and D. Determine the reaction forces at supports A and B with the aid of a free body diagram.

*Sebuah rasuk juntai dengan panjang 14 meter disokong oleh pin dan roller, seperti yang ditunjukkan dalam **Rajah B2(a)**. Rasuk ini dikenakan beban teragih seragam sebanyak 25 kN/m dan beban tumpu 50 kN di titik C dan D. Tentukan daya tindak balas di sokongan A dan B dengan bantuan gambarajah jasad bebas.*

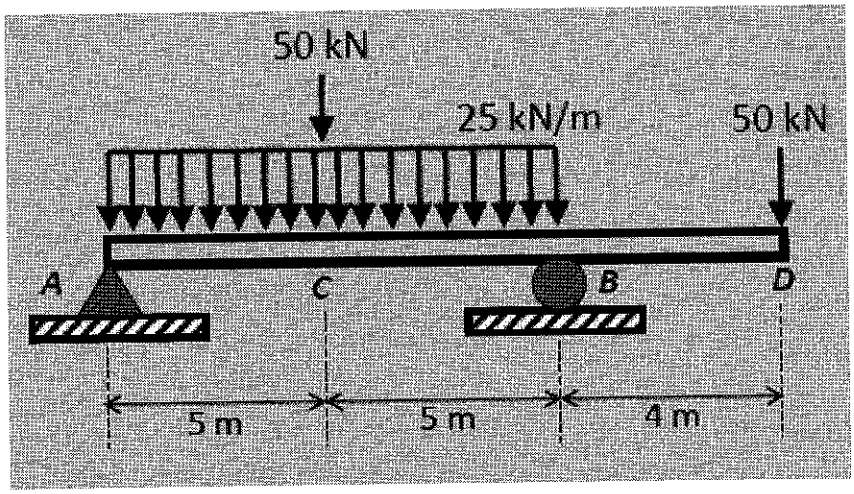

Figure B2(a)/ *Rajah B2(a)*

[10 marks]
[*10 markah*]

CLO2 (b) A simply supported beam that carries point load, moment, and uniformly distributed load is shown in **Diagram B1(b)**. With the aid of the shear force and bending moment diagram, calculate the value of shear force and bending moment for the structure which has been analyzed below.

*Satu rasuk disokong mudah yang menanggung beban tumpu, moment dan beban teragih seragam ditunjukkan dalam **Rajah B1(b)**. Dengan bantuan gambarajah beban ricih dan momen lentur, kirakan nilai daya ricih dan momen lentur bagi struktur yang telah di analisa dibawah.*

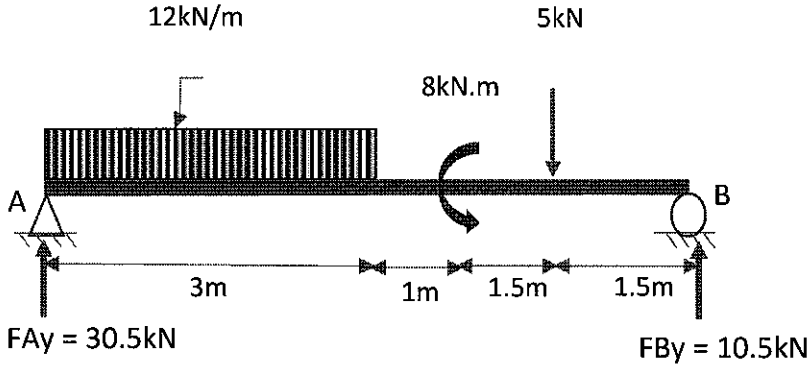

Diagram B1(b)/ *Rajah B1(b)*

[15 marks]

[*15 markah*]

QUESTION 3

SOALAN 3

CLO2 (a) A cantilever beam with a length of 10 meters is fixed at one end (Support A) and free at the other end. The beam is subjected to a uniformly distributed load of 20 kN/m and an inclined point load of 10 kN, as shown in **Figure B3(a)**. Calculate the reactions at fixed end support, A using a free-body diagram.

*Sebuah rasuk julur dengan panjang 10 meter dipasang pada satu hujung terikat (tupang A) dan bebas di hujung yang satu lagi. Rasuk tersebut menampung beban teragih seragam sebanyak 20 kN/m dan beban tumpu condong sebanyak 10 kN seperti yang ditunjukkan dalam **Rajah B3(a)**. Kirakan tindakbalas pada hujung terikat,A dengan menggunakan gambarajah jasad bebas.*

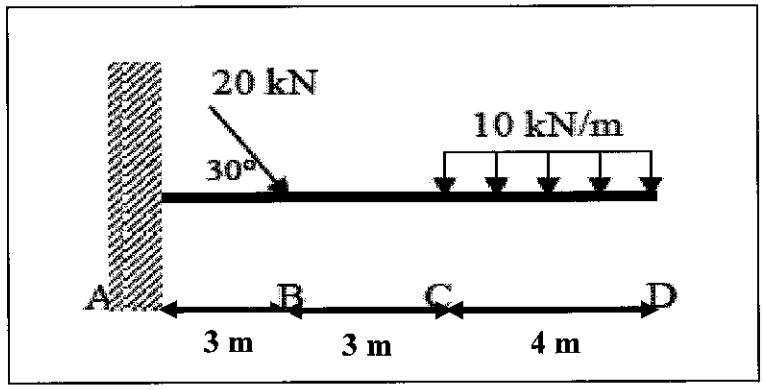

Figure B3(a)/ *Rajah B3(a)*

[10 marks]

[*10 markah*]

CLO2 (b) The simply supported beam is supported by a pin and a roller, as shown in **Figure B3(b)**. The beam is subjected to two different uniformly distributed loads, 30 kN/m and 40 kN/m. A point load of 25 kN has also been applied to the beam. With the aid of free body diagram;

Rasuk disokong mudah ditupang oleh pin dan rola, seperti yang ditunjukkan dalam Rajah B3(b). Rasuk tersebut dikenakan dua beban yang diagihkan secara seragam, iaitu 30 kN/m dan 40 kN/m. Beban tumpu sebanyak 25 kN juga telah dikenakan ke atas rasuk. Dengan bantuan gambarajah jasad bebas;

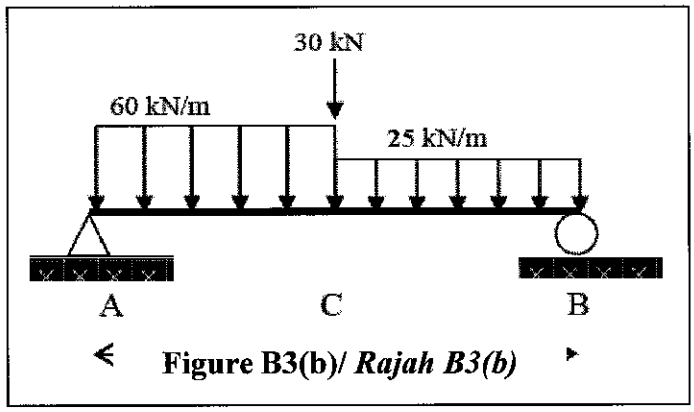

Figure B3(b)/ *Rajah B3(b)*

(i) Identify the value of reaction forces at supports A and B.

Kenalpasti nilai daya tindak balas pada tupang A dan B.

[6 marks]
[*6 markah*]

(ii) Sketch the shear force and bending moment diagrams, including the corresponding values.

Lakarkan gambarajah daya ricih dan momen lentur beserta nilai-nilai yang berkaitan.

[9 marks]
[*9 markah*]

QUESTION 4
SOALAN 4

An overhanging beam with a length of 7 meters is supported by a pin and a roller, as shown in **Figure B4(a)**. It carries a uniformly distributed load of 60 kN/m along its entire length and point loads of 45 kN at point D. With the aid of a free body diagram, determine the reaction forces at supports A and B.

Rasuk juntai dengan panjang 7 meter disokong oleh pin dan rola, seperti yang ditunjukkan dalam ***Rajah B4(a)****. Rasuk tersebut menanggung beban teragih seragam sebanyak 60 kN/m pada keseluruhan panjang rasuk dan beban tumpu sebanyak 45 kN di titik D. Dengan bantuan gambarajah jasad bebas, tentukan daya tindakbalas pada sokongan A dan B.*

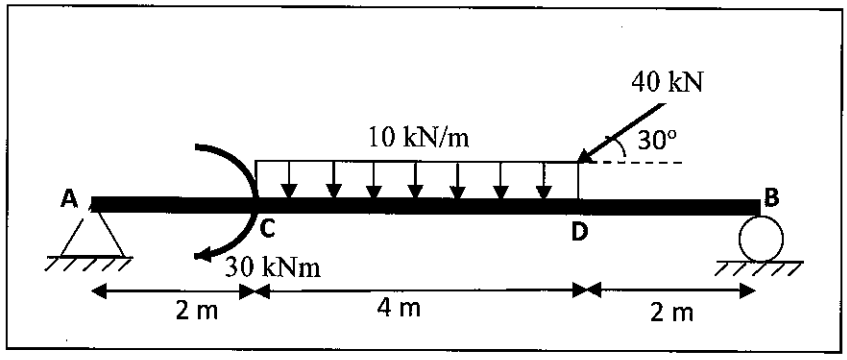

Figure B4/ *Rajah B4*

CLO2 (a) With the aid of a free body diagram, determine the reaction forces at supports A and B.

Dengan bantuan gambarajah jasad bebas, tentukan daya tindakbalas pada sokongan A dan B.

[10 marks]
[*10 markah*]

CLO2

(b) Based on the reaction forces at supports A and B above;

Merujuk kepada nilai daya tindakbalas di support A dan B di atas;

(i) Calculate the value of shear force and bending moment for the beam.

Kirakan nilai daya ricih dan momen lentur bagi rasuk tersebut.

[8 marks]

[*8 markah*]

(ii) Sketch the shear force and bending moment diagram.

Lakarkan gambarajah daya ricih dan momen lentur.

[7 marks]

[*7 markah*]

SOALAN TAMAT