

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN KEJURUTERAAN MEKANIKAL

PEPERIKSAAN AKHIR

SESI JUN 2018

DJJ3053 : ENGINEERING MECHANICS

TARIKH : 04 NOVEMBER 2018

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

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

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

CLO1
C1

(a) Define the terms below.

Takrifkan istilah di bawah.

i. Static

Statik

[2 marks]

[2 markah]

ii. Dynamic

Dinamik

[2 marks]

[2 markah]

CLO1
C2

(b) Determine the x and y components of each force acting on the screw eye shown in **Figure 1(b)**.

Tentukan nilai komponen x dan y bagi setiap daya yang bertindak pada mata skru yang ditunjukkan dalam Rajah 1(b).

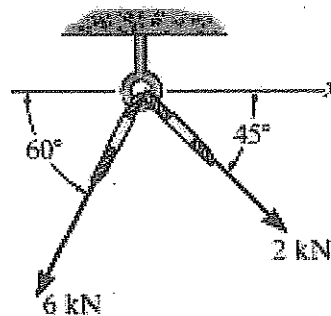


Figure 1(b) / Rajah 1(b)

[5 marks]

[5 markah]

CLO1
C3

- (c) Based on **diagram 1(c)** if $F_1 = 500\text{ N}$ and $\theta = 20^\circ$, calculate the magnitude and direction measured counterclockwise from the positive x axis of the resultant force produced from the three forces acting on the A ring.

Berdasarkan rajah 1(c) jika $F_1 = 500\text{ N}$ dan $\theta = 20^\circ$, kirakan magnitud dan arah yang diukur mengikut arah lawan jam dari paksi x positif bagi daya paduan yang dihasilkan dari tiga daya yang bertindak pada gelang A.

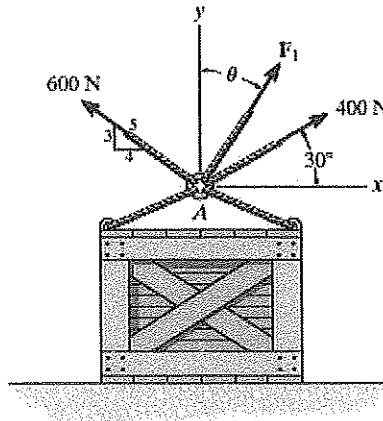


Diagram 1(c) / Rajah 1(c)

[10 marks]

[10 markah]

CLO1
C4

- (d) By using parallelogram, calculate:

Dengan menggunakan parallelogram, kirakan:

- i. The magnitude of the component force F in **Figure 1(d)** and the magnitude of the resultant force F_R if F_R is directed along the positive y axis.

*Kirakan magnitud daya komponen F dalam **Rajah 1(d)** dan magnitud daya yang dihasilkan F_R jika F_R diarahkan sepanjang paksi y positif.*

[4 marks]

[4 markah]

- ii. Predict what will happen to the resultant force if the value of F is 300N.

Jangkakan apa yang berlaku kepada daya paduan sekiranya nilai F adalah 300N.

[2 marks]

[2 markah]

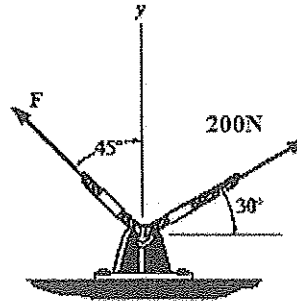


Figure 1(d) / Rajah 1(d)

QUESTION 2

SOALAN 2

CLO 1
C1

- (a) A sphere has been attached to a spring as shown in Figure 2(a) below. Draw a free body diagram of the sphere, the cord CE and the knot at C.

Satu sfera telah disambungkan kepada sebuah pegas seperti Rajah 2(a) di bawah. Lukiskan gambarajah badan bebas pada sfera, tali CE dan simpulan pada C.

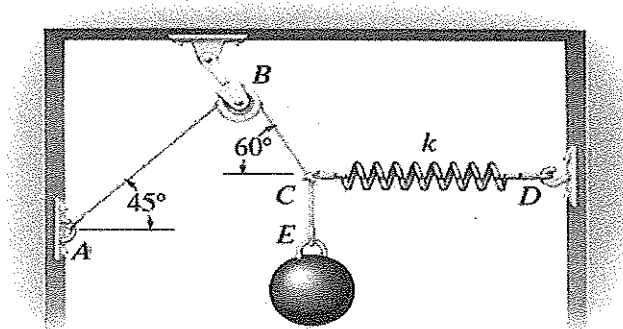


Figure 2(a) / Rajah 2(a)

[4 marks]

[4 markah]

CLO 1
C2

- (b) A 5kg block is suspended from pulley B and the sag of the cord is $d = 0.15\text{m}$. Determine the force in cord ABC. Neglect the size of the pulley.

Sebuah blok seberat 5kg tergantung pada takal B dan melentur pada ketinggian $d = 0.15\text{m}$. Tentukan daya yang bertindak pada kabel ABC. Abaikan saiz takal.

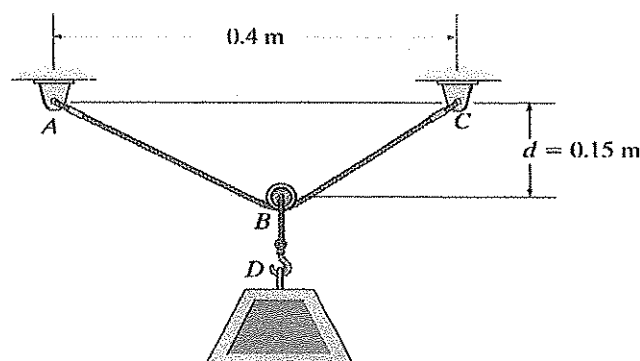


Figure 2(b) / Rajah 2(b)

[9 marks]

[9 markah]

CLO 1
C3

(c) Calculate the forces of each member of the roof truss shown in Figure 2(c) and indicate if the members are in tension or compression.

Kirakan nilai daya bagi setiap rasuk kekuda bumbung seperti dalam Rajah 2(c) dan nyatakan samada rasuk tersebut berada dalam keadaan tegangan atau mampatan.

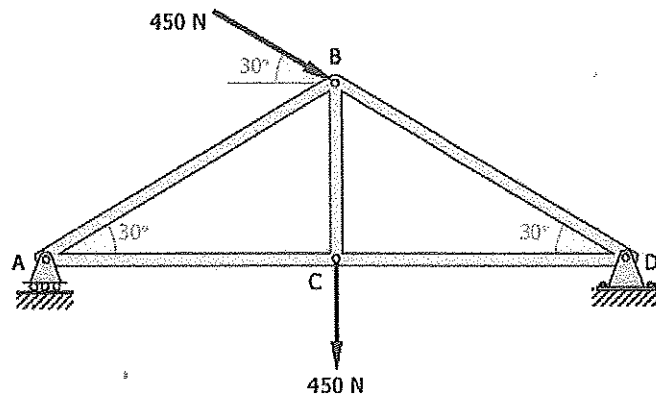


Figure 2(c) / Rajah 2(c)

[12 marks]

[12 markah]

QUESTION 3

SOALAN 3

CLO1
C1

(a) Define the terms below.

Takrifkan istilah di bawah.

i. Kinematic

Kinematik

[2 marks]

[2 markah]

ii. Kinetic

Kinetik

[2 marks]

*[2 markah]*CLO1
C2

(b) A ball is thrown downward from a 50m tower with an initial velocity of 18m/s. Determine the velocity at which it hits the ground and the time of travel.

Sebiji bola dibuang ke bawah dari sebuah menara yang berketinggian 50m dengan halaju awal 18m/s. Tentukan halaju bola tersebut semasa mula menyentuh tanah dan masa yang diambil untuk perjalanan tersebut.

[5 marks]

[5 markah]

CLO1
C3

- (c) A car travels in a straight line with initial velocity 10m/s and it accelerates uniformly at 2 m/s^2 for 100m . Then, it travels at a constant velocity for 20 seconds. Finally, it slows at a constant deceleration for 15 seconds until it stops.

Sebuah kereta bergerak lurus dengan halaju awal 10m/s dan memecut seragam pada 2m/s^2 sejauh 100m . Kemudian, kereta tersebut bergerak dengan halaju seragam selama 20 saat. Akhirnya, kereta tersebut mula bergerak perlahan dengan nyahpecutan seragam selama 15 saat sehingga ianya berhenti.

- i. Sketch a velocity-time graph

Lakarkan graf halaju melawan masa

[4 marks]

[4 markah]

- ii. Calculate the constant velocity of the car

Kirakan halaju seragam kereta tersebut

[2 marks]

[2 markah]

- iii. Calculate the deceleration of the car

Kirakan nyahpecutan kereta tersebut

[2 marks]

[2 markah]

- iv. Calculate the total distance for the journey

Kirakan jumlah jarak untuk perjalanan tersebut

[2 marks]

[2 markah]

CLO1
C4

- (d) A car has an acceleration and a deceleration of 5m/s^2 . If it starts from rest, and can have a maximum velocity of 60m/s , predict the shortest time it can travel for a distance of 1200m before it stops.

Sebuah kereta mempunyai pecutan dan nyahpecutan 5m/s^2 . Sekiranya kereta tersebut bermula dari keadaan pegun, dan kereta tersebut mampu mencapai kelajuan maksimum 60m/s , jangkakan masa terpendek yang diambil untuk jarak perjalanan 1200m sebelum ianya berhenti.

[6 marks]

[6 markah]

QUESTION 4

SOALAN 4

CLO1
C1

(a) Describe Newton's second law.

Terangkan hukum Newton kedua.

[4 marks]

[4 markah]

CLO1
C2(b) A 1500 kg crate is pulled along the ground with a constant speed of a distance for 25m, using a cable that makes a horizontal angle of 15° . Determine the tension in the cable. The coefficient of kinetic friction between the ground and the crate is $\mu_k = 0.55$.*Sebuah kotak 1500kg ditarik di atas lantai dengan halaju sekata berjarak 25m, menggunakan kabel yang bersudut 15° mengufuk. Kirakan daya tegangan kabel tersebut. Pekali geseran kinetik di antara lantai dan kotak ialah $\mu_k = 0.55$.*

[9 marks]

[9 markah]

CLO1
C3

(c) An object of 3kg dropped from 15m height. Calculate:

Satu objek yang berjisim 3kg telah jatuh dari ketinggian 15m. Kirakan:

i. Potential energy and kinetic energy possessed by the object before it dropped.

Tenaga keupayaan dan tenaga kinetik yang dimiliki oleh objek sebelum ia jatuh.

[5 marks]

[5 markah]

ii. Potential energy and kinetic energy possessed by the object after it dropped and landed on the ground.

Tenaga keupayaan dan tenaga kinetik yang dimiliki oleh objek selepas ia jatuh dan menyentuh lantai.

[7 marks]

[7 markah]

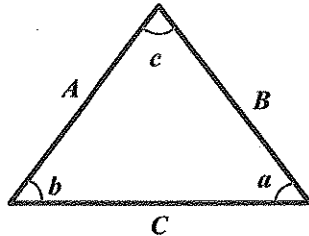
SOALAN TAMAT

LIST OF FORMULA

DJJ3053 – ENGINEERING MECHANICS

STATICS

1. TRIANGLE RULE



Sine law:

$$\frac{A}{\sin a} = \frac{B}{\sin b} = \frac{C}{\sin c}$$

Cosine law:

$$C = \sqrt{A^2 + B^2 - 2AB \cos c}$$

2. ADDITION OF SYSTEM OF COPLANAR FORCE

$$(\rightarrow) \Sigma F_x = F_{1x} + F_{2x} - F_{3x}$$

$$(+\uparrow) \Sigma F_y = F_{1y} - F_{2y} + F_{3y}$$

$$F_R = \sqrt{(\Sigma F_x)^2 + (\Sigma F_y)^2}$$

$$\theta = \tan^{-1} \left| \frac{\Sigma F_y}{\Sigma F_x} \right|$$

3. CARTESIAN VECTOR

$$\mathbf{A} = A_x \mathbf{i} + A_y \mathbf{j} + A_z \mathbf{k}$$

$$\mathbf{u}_A = \frac{\mathbf{A}}{A} = \frac{A_x}{A} \mathbf{i} + \frac{A_y}{A} \mathbf{j} + \frac{A_z}{A} \mathbf{k}$$

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$$

$$\mathbf{F}_R = \Sigma \mathbf{F} = \Sigma F_x \mathbf{i} + \Sigma F_y \mathbf{j} + \Sigma F_z \mathbf{k}$$

$$\mathbf{r} = (x_B - x_A) \mathbf{i} + (y_B - y_A) \mathbf{j} + (z_B - z_A) \mathbf{k}$$

$$\mathbf{F} = F \mathbf{u} = F \frac{\mathbf{r}}{r}$$

4. EQUILIBRIUM OF PARTICLE

$$\Sigma \mathbf{F} = 0$$

$$F = ks$$

DYNAMICS

1. RECTILINEAR MOTION OF PARTICLES

$$v = ds/dt$$

$$a = dv/dt$$

2. UNIFORM RECTILINEAR MOTION

- a constant

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$s = \frac{1}{2}(v+u)t$$

$$v = r\omega$$

$$a = r\alpha$$

3. WORK OF FORCE

$$U_{1 \rightarrow 2} = (F \cos \alpha) \Delta x$$

4. KINETIC ENERGY OF PARTICLE

$$KE = \frac{1}{2}mv^2$$

$$U_{1 \rightarrow 2} = T_2 - T_1$$

5. POTENTIAL ENERGY

$$PE = mgh$$