

SULIT



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

JABATAN KEJURUTERAAN MEKANIKAL

**PEPERIKSAAN AKHIR
SESI DISEMBER 2015.**

DJJ3053 : ENGINEERING MECHANICS

**TARIKH : 02 APRIL 2016
MASA : 11.15 AM – 1.15 PM (2 JAM)**

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.
Struktur (4 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTIONS:

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) List **THREE (3)** basic measurement quantities.
Senaraikan TIGA (3) kuantiti asas pengukuran.

[3 marks]

[3 markah]

CLO1
C2

- (b) The screw eye in Figure 1 (b) is subjected to two forces, F_1 and F_2 . Determine the magnitude of F_x and F_y .

Skrus jenis mata dalam Rajah 1(b) mempunyai dua daya F_1 dan F_2 . Tentukan magnitud bagi F_x dan F_y .

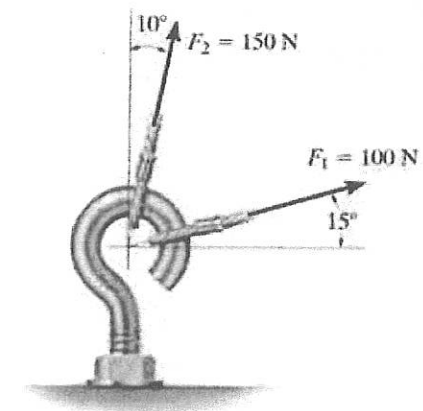


Figure 1(b) / Rajah 1(b)

[5 marks]

[5 markah]

CLO1
C3

- (c) Solve the x and y component of F_1 and F_2 acting on the boom as shown in Figure 1(c) in terms of Cartesian vector.

Selesaikan nilai x dan y pada komponen F_1 dan F_2 bertindak pada ledakan yang ditunjukkan dalam Rajah 1 (c) dalam bentuk Cartesian vector.

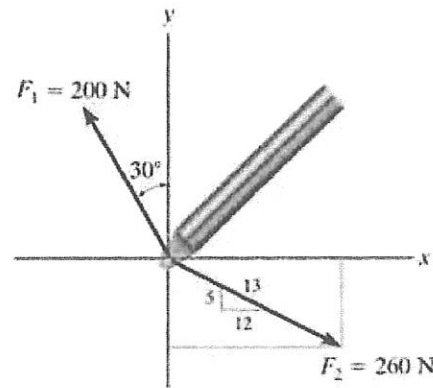


Figure 1(c) / Rajah 1(c)

[7 marks]

[7 markah]

CLO1
C4

- (d) The end of the boom O in Figure 1 (d) is subjected to three concurrent and coplanar forces. Determine the magnitude and direction of the resultant force.

Pada titik O dalam Rajah 1 (d) tertakluk kepada tiga daya serentak dan sesatah. Tentukan magnitud dan arah daya paduan.

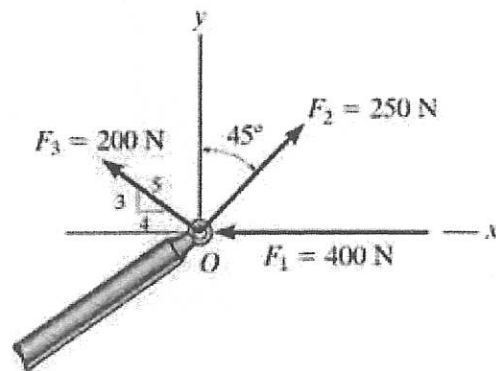


Figure 1(d) / Rajah 1(d)

[10 marks]

[10 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- (a) Define the definition and condition for the equilibrium of a particle.

Takrifkan definisi dan keadaan keseimbangan bagi sesuatu zarah.

[3 marks]

[3 markah]

CLO1
C2

- (b) BA and BC cables are needed to support the 60 kg cylinder in Figure 2(b). Draw a free-body diagram for:

Kabel BA dan BC diperlukan untuk menahan silinder berjisim 60 kg seperti Rajah 2(b). Lakarkan rajah jasad bebas bagi:

2(b). Lakarkan rajah jasad bebas bagi:

- i. Cylinder

Silinder

- ii. BD Cord

Kabel BD

- iii. Ring at B

Gegelang di B

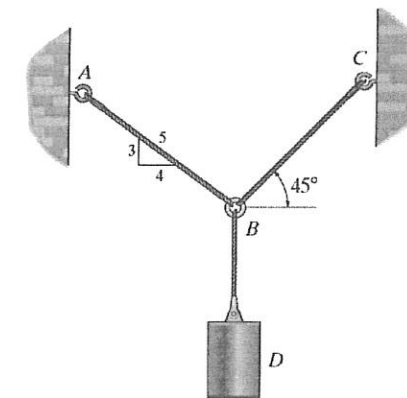


Figure 2(b) / Rajah 2(b)

[5 marks]

[5 markah]

CLO1
C3

- (c) If the mass of C cylinder is 40 kg, determine the mass of A cylinder in order to hold the assembly in the position shown in Figure 2(c).
 Sekiranya jisim silinder C ialah 40 kg, tentukan jisim silinder A seperti pemasangan yang ditunjukkan di dalam Rajah 2(c).

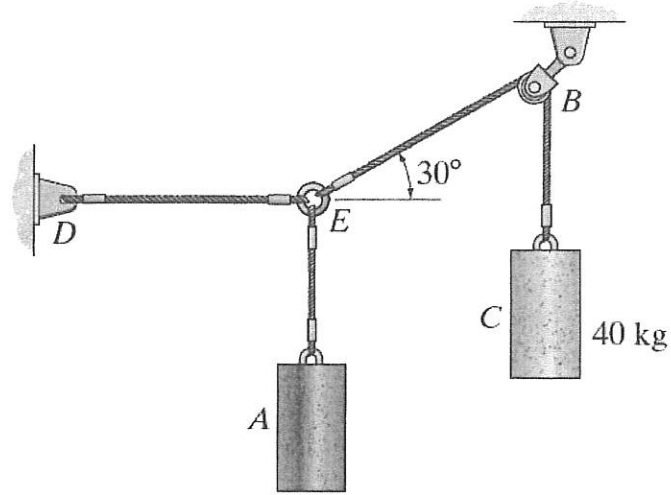


Figure 2(c) / Rajah 2(c)

[7 marks]
[7 markah]

CLO1
C4

- (d) Determine the force for KJ, KD and CD of the Pratt truss in Figure 2(d). State if the parts are in tension or compression.
 Tentukan daya untuk KJ, KD dan CD pada kekuda Pratt didalam Rajah 2(d). Nyatakan sama ada anggota ini mengalami tegangan atau mampatan.

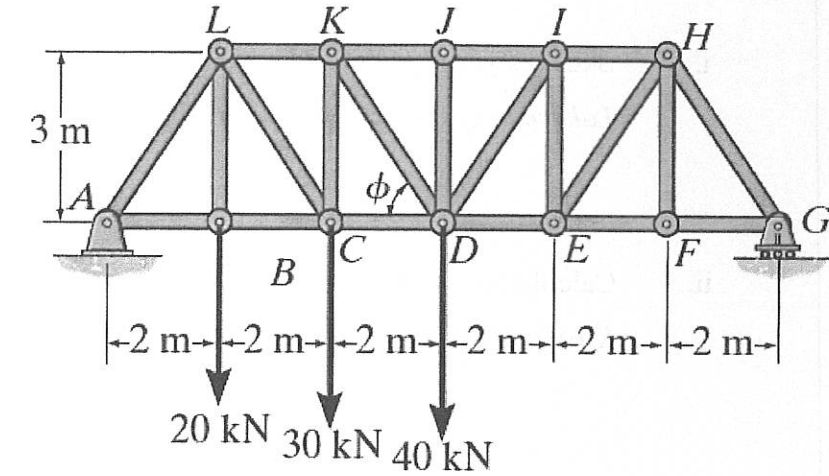


Figure 2(d) / Rajah 2(d)

[10 marks]
[10 markah]

QUESTION 3
SOALAN 3

CLO1
C1

- (a) State the concept of kinematics of particles.
 Nyatakan konsep bagi kinematik suatu zarah.

[3 marks]
[3 markah]

CLO1
C2

- (b) A truck travelling along a straight road at 20km/h and the speed increases its speed to 120km/h in 15 s. Calculate the distance travelled . (The answer must be in SI unit)
 Sebuah trak bergerak di sepanjang jalan lurus pada 20km / j, dan kelajuannya meningkat kepada 120km / j dalam masa 15 s. Kirakan jarak yang dilalui.
 (Jawapan mestilah dalam unit SI)

[5 marks]
[5 markah]

CLO1
C3

- (c) A car starts from rest with a constant acceleration of 2.3 m/s^2 for 16 seconds. Then, the car decelerates uniformly at 3 m/s^2 and finally stops.

Sebuah kereta bermula dari rehat dengan pecutan seragam 2.3 m/s^2 selama 16 saat. Kemudian kereta tersebut mengalami nyahpecutan seragam sebanyak 3 m/s^2 dan akhirnya kereta tersebut berhenti.

- i. Sketch a graph of velocity (v) against time (t) for the journey
Lakarkan graf halaju melawan masa untuk perjalanan tersebut

[3 marks]

[3 markah]

- ii. Calculate the velocity for the car
Kirakan halaju bagi kereta tersebut

[2 marks]

[2 markah]

- iii. Calculate the time taken when it uniformly decelerates
Kirakan masa yang diambil apabila ia menyahpecutan seragam

[2 marks]

[2 markah]

CLO1
C4

- (d) The motion of a particle is defined by the relation $x = 6t^4 - 2t^3 - 12t^2 + 3t + 3$, where x and t are expressed in meters and seconds respectively. Determine the time, the position and the velocity when $a = 0$

Pergerakan zarah telah ditakrifkan oleh persamaan $x = 6t^4 - 2t^3 - 12t^2 + 3t + 3$, di mana x dan t dinyatakan masing-masing dalam meter dan saat. Tentukan masa, kedudukan dan halaju apabila $a = 0$

[10 marks]

[10 markah]

QUESTION 4

SOALAN 4

CLO1
C1

- (a) Define the concept of kinetics of particles.
Takrifkan secara ringkas konsep kinetik zarah.

[3 marks]

[3 markah]

CLO1
C2

- (b) Describe the following terms:
Terangkan istilah berikut:

- i. Displacement
Anjakan

- ii. Acceleration
Pecutan

[5 marks]

[5 markah]

CLO1
C3

- (c) A static lift starts to move upward with a constant acceleration. After 4 seconds, the velocity of a lift is 8 m/s and moving with this velocity in 2 seconds. After that, the lift is slowed down constantly and the lift stops after 9 seconds.

Sebuah lif pegun mula bergerak ke atas dengan pecutan seragam. Selepas 4 saat, lif mencapai halaju 8 m/s dan bergerak dengan halaju ini selama 2 saat. Kemudian lif diperlahankan secara seragam dan lif berhenti 9 saat selepas permulaan gerakannya.

- i. Sketch a graph of velocity vs time
Lakarkan graf halaju melawan masa

[1 marks]

[1 markah]

- ii. Calculate the total distance covered by the lift
Kirakan jumlah jarak yang telah dilalui oleh lif

[2 marks]

[2 markah]

- iii. Calculate the lift acceleration
Kirakan pecutan oleh lif

[2 marks]

[2 markah]

- iv. Calculate the lift deceleration
Kirakan nyahpecutan oleh lif

[2 marks]

[2 markah]

CLO1
C4

- (d) An object has a mass of 3kg is falling down from 15 m height. Determine:
Satu objek yang berjisim 3kg telah jatuh dari ketinggian 15 m. tentukan :

- i. Potential energy and kinetic energy possessed by the object before it fell.
Tenaga keupayaan dan tenaga kinetic yang dimiliki oleh objek sebelum ia jatuh.

[4 marks]

[4 markah]

- ii. Potential energy and kinetic energy possessed by the object after it fell and touched the ground.
Tenaga keupayaan dan tenaga kinetic yang dimiliki oleh objek selepas ia jatuh dan menyentuh lantai.

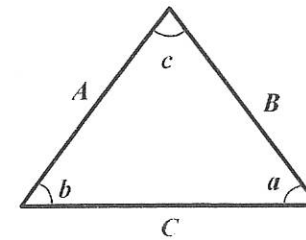
[6 marks]

[6 markah]

SOALAN TAMAT

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

$$v = dx/dt$$

$$a = dv/dt$$

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

$$PE = mgh$$