SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

DISEMBER 2016

BB101 : ENGINEERING SCIENCE

TARIKH : 01 APRIL 2017
MASA : 8.30 AM – 10.30 AM (2 JAM)

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

Struktur (6 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

This paper consists of 6 structured questions. Answer any **FOUR (4)** questions.

QUESTION 1

(a) Give the definition for each the following:

i. Scalar quantitiy. (1 marks)

ii. Vector quantity. (1 marks)

(b) Define the following terms:

i. Velocity (1 mark)

ii. Displacement (1 mark)

iii. Acceleration (1 mark)

(c) The speed of a car traveling along a straight road decreases uniformly from 12 ms^{-1} to 8 ms^{-1} over 88 m. Calculate:

i. The deceleration of the car (4 marks)

ii. The time taken by the car. (4 marks)

(d) A car starting from rest accelerated uniformly to 40 m/s over a period of 10 seconds. The car then maintained the velocity for 20 seconds. The velocity is then reduced uniformly to 20 m/s in 10 seconds and finally brought to rest after another further 10 seconds.

i. Sketch its Velocity – Time graph, (4 marks)

ii. Calculate the acceleration for the first 10 seconds. (3 marks)

iii. Find the total distance travelled by the car. (5 marks)

QUESTION 2

(a) Define force and its unit. (2 marks)

(b) Differentiate between weight and mass. (4 marks)

(c) Calculate the values of F_2 so that the objects are in equilibrium.

i.

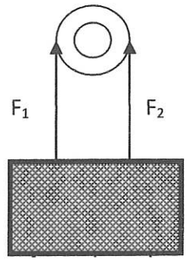


Figure 2c (i)

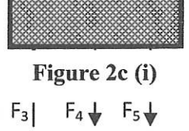
F_1 = 100 N

F_2 = ? N

F_3 = 150 N

F_4= 100 N

F_5 = 200 N



(2 marks)

ii.

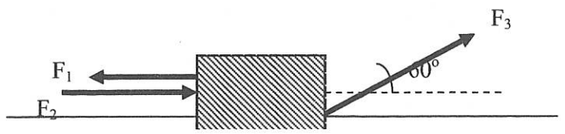


Figure 2c (ii)

F_1 = 10 N

F_2 = ? N

F_3 = 4 N

(2 marks)

(d) Calculate the magnitude of the resultant force for **Figure 2(d).**

(5 marks)

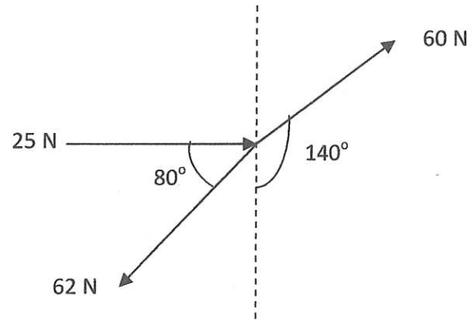


Figure 2(d)

(e)

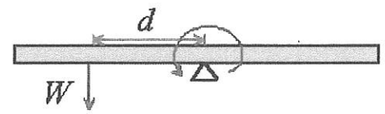


Figure 2(e)

Based on **Figure 2(e)** a weight, W is hung at a beam with distance, d to the left of the pivot.

i. What will happen to the beam?

(1 mark)

ii. Explain briefly how to ensure the beam is in equilibrium.

(3 marks)

(f) From **Figure 2(f)** calculate the moment so that the bar is in equilibrium. (2 marks)

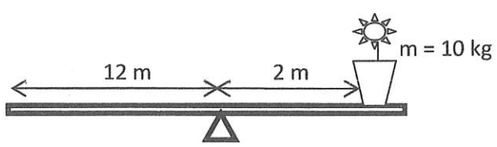


Figure 2(f)

(g) Forces are applied on the beam in **Figure 2(g).** Find the centre of gravity so that it is in equilibrium.

(4 marks)

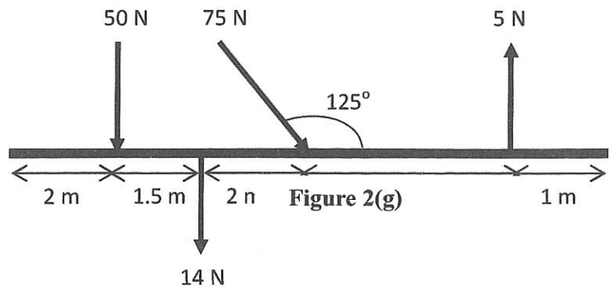


Figure 2(g)

QUESTION 3

a) State the definitions and its S.I unit for each of the following :

i. Work (2 marks)

ii. Energy (2 marks)

iii. Power (2 marks)

b) A girl whose mass is 50 kg runs up a flight of stairs 10 m high in 20 s. Find the average power she generated? (The acceleration due to gravity is 10 ms^{-2})

(3 marks)

c) A crane's efficiency to lift a load of 5000 kg through a vertical height of 20 m in 5 s is 80%. Determine the input power of the crane?

(3 marks)

d) A 0.15 kg ball is dropped from rest at a height of 2 m. It bounces to a maximum height of 1.8 m as shown in **Figure 3(d).** (Acceleration due to gravity = 10 ms^{-1})

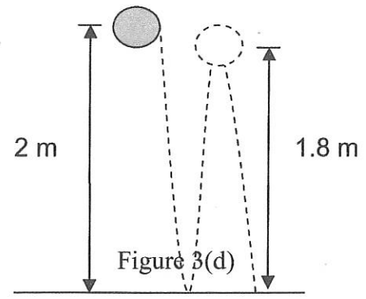


Figure 3(d)

i. Find the potential energy of the ball at the position of release.

(3 marks)

ii. Calculate the energy loss after the first bounce when the current height of the ball is 1.8 m.

(5 marks)

iii. After reaching 1.8 m, the ball falls and bounces again. Assuming that the energy loss in each bounce is the same, find the maximum height reached by the ball after the second bounce.

(5 marks)

QUESTION 4

(a) i. Give the definition of the following:

- Density. (2 marks)
- pressure. (2 marks)

ii. State the **TWO (2)** characteristics of each of the following:

- solid. (2 marks)
- liquid. (2 marks)
- gas. (2 marks)

(b) A student determines that a piece of paper has a mass of 4.3g and a volume of 9.4cm^3. What is the density of the paper in g/cm^3?

(2 marks)

(c) i. The mass of a brick with the dimension of 0.25m x 0.10m x 0.07m is 3kg. When it is placed on the floor, calculate the minimum pressure.

(4 marks)

ii. A submarine can withstand sea water pressure up to 350MPa. What is the maximum depth the submarine can go under the sea water surface? (g=10kg/m^3, density of sea water = 1g/cm^3)

(4 marks)

(d) **Figure 4(d)** shows a hydraulic lift with input piston of diameter 0.2 m and output piston of diameter 0.6 m. What is the minimum force applied to the input piston to lift a load of weight 100N?

(5 marks)

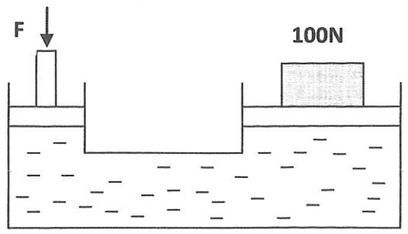


Figure 4(d)

QUESTION 5

(a)

i. Give the definition of the following:

- heat. (2 marks)
- temperature. (2 marks)

ii. State and explain **THREE (3)** ways of heat transfer. (6 marks)

(b)

i. The quantity of heat released from 1kg of liquid is 1.68 x 10^5 J when its temperature changes by 40^{o}C. Calculate specific heat capacity of the liquid.

(3 marks)

ii. The water in the ice maker of a refrigerator has a mass of 0.4kg and temperature of water of 22^{o}C.What is the temperature of the water after 33600 J of heat has been removed from it? (specific heat capacity of water = 4200 J kg^{-1} ^{0}C^{-1})

(4 marks)

(c) 500g of liquid A at the temperature of 70°C is mixed with 900g of liquid B with mass, m at temperature 15°C. If the final temperature of the mixture is 45°C,
(Specific heat capacity of liquid A = 850 J^o kg^{-1} °C^{-1}and specific heat capacity of liquid B = 350 J^o kg^{-1} °C^{-1})

i. Calculate the heat released by liquid A. (2 marks)

ii. Determine the mass, m of liquid B. (6 marks)

QUESTION 6

(a) Give **TWO (2)** types of electric circuits and draw their simple schematic diagrams. (6 marks)

(b) If 50 C of an electric charge flows through a wire in 1.5 minutes, what is the current in the wire? (4 marks)

(c) In **Diagram 6(c),** three resistors of 22 Ω, 15 Ω and 10 Ω are connected in parallel to a 6V battery. Calculate:

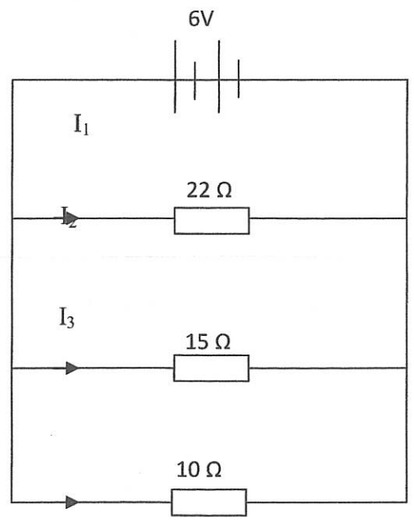


Diagram 6(c)

i. The total resistance of the circuit (3 marks)

ii. The current I_1, I_2 and I_3. (6 marks)

iii. The total current flowing in the circuit (2 marks)

(e) A 25 Volt supply is used to charge a capacitor of 3.5 μ F. Determine the charge stored in the capacitor plates.

(4 marks)

SOALAN TAMAT