UNIVERSITI KUALA LUMPUR

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MALAYSIA ITALY DESIGN INSTITUTE

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE	: PPB 10303
COURSE NAME	: ENGINEERING SCIENCES
PROGRAMME NAME	: BACHELOR
DATE	: 29 JUNE 2026
TIME	: 9.00 AM – 11.00 AM
DURATION	: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of ONE (1) section; Section A.
4. Section A consists of five questions. Answer FOUR (4) questions only.
5. Please write your answers on the ANSWER BOOKLET provided.
6. Please CLEARLY write the number of the questions in the ANSWER BOOKLET.
7. Formula sheet has been appended for your reference.

THERE ARE 4 PAGES OF QUESTIONS, EXCLUDING THIS PAGE

SECTION A (Total: 100 marks)

INSTRUCTION: Answer FOUR (4) questions ONLY.
Please use the answer booklet provided.

Question 1

(a) Convert the following and express the result to three significant figures. Use an appropriate prefix:

(Given 1 lb = 4.4482 N, 1 ft = 0.3048 m)

i. 200 lb.ft to N.m

ii. 50 lb/ft^3 kN/m^3

iii. 8 ft/h to mm/s

iv. 25 rpm to m/s

v. 6200 km/h to m/s

(9 marks)

(b) Represent each of the following quantities in the correct SI form using an appropriate prefix:

i. 0.000 752 km (change to m)

ii. 4.72 Gg (change to g)

iii. 0.00386 MJ (change to J)

(6 marks)

(c) The link in Figure 1 is subjected to two forces F1 and F2 . Determine the magnitude and direction of the resultant force.

(10 marks)

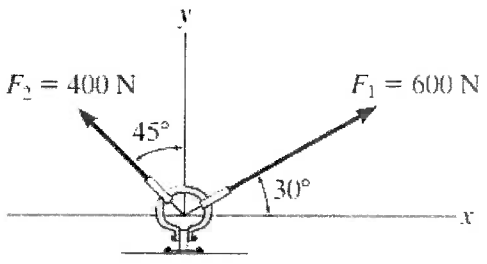


Figure 1

Question 2

(a) A bus starts from rest with a constant acceleration of 1 m/s^2. Calculate the time required for it to attain a speed of 25 m/s and the distance traveled.

(5 marks)

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

(5 marks)

(c) A velocity-time (v-t) graph in Figure 2 shows the motion of a lift.

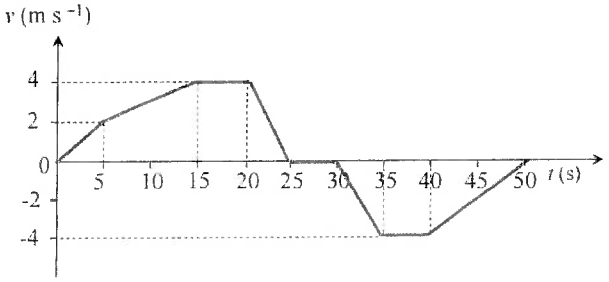


Figure 2

i. Describe the motion of the lift in the following time intervals based on the graph in Figure 2: From t = 0 to 5 s, from t = 15 to 20 s, from t = 20 to 25 s and from t = 40 to 50 s.

(8 marks)

ii. Sketch a graph of acceleration (m/s^2) against time (s) at the time interval $0 \leq t \leq 20$s.

(7 marks)

Question 3

(a) State and describe Newton's three Laws of Motion.

(3 marks)

(b) Solve the following problems:

i. A small child has a wagon with a mass of 10 kilograms. The child pulls on the wagon with a force of 2 newtons. Calculate the acceleration of the wagon?

(3 marks)

ii. When Jane drives to work, she always places her purse on the passenger's seat. By the time she gets to work, her purse has fallen on the floor in front of the passenger seat. One day, she asks you to explain why this happens in terms of physics. How will you explain this situation?

(4 marks)

(c) If the 50-kg crate in Figure 3 is subjected to a force of P = 200 N, determine its speed when it has traveled 15 m starting from rest. The coefficient of kinetic friction between the crate and the ground is $\mu k = 0.3$.

(15 marks)

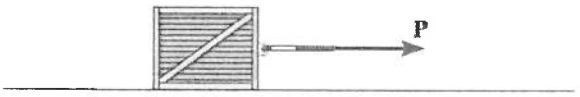


Figure 3

Question 4

(a) An insect in Figure 4 moves in a circle of 2 m diameter and completes 10 revolutions per second. Calculate the angular velocity, linear velocity and centripetal acceleration.

(15 marks)

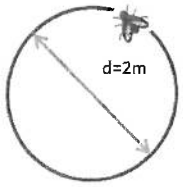


Figure 4

(b) Calculate the force acting on a particle of mass 10 kg moving in a circle of radius 8 m at an angular speed of 40 rad/s.

(10 marks)

Question 5

(a) Explain the work-energy theorem with the related equation.

(5 marks)

(b) A car of mass 1300 kg in Figure 5 is travelling along a straight level road at 10 m/s when the traffic lights change from green to yellow. The driver applies the brakes 23 metres from the lights and just manages to stop on the line.

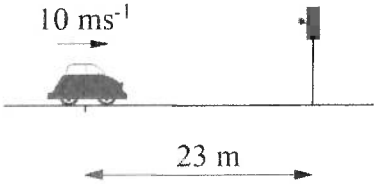


Figure 5

i. Calculate the kinetic energy of the car before braking.

(5 marks)

ii. Calculate the work done in bringing the car to rest.

(10 marks)

iii. Calculate the force due to the brakes, friction, etc. against which work is done.

(5 marks)

END OF EXAMINATION PAPER

APPENDIX

LIST OF FORMULAE

UNIT CONVERSION

1 litre = 10^{-3} m^3

1 meter = 3.281 feet

1 mile = 5280 feet

1 hour = 60 minutes

1 minute = 60 seconds

1 mph = 1.60934 kmph

LINEAR KINEMATICS

$v = v_0 + at$

$v^2 = v_0^2 + 2as$

$S = v_0t + 1/2\,at^2$

FORCES AND NEWTON'S LAW OF MOTION

$F = ma$

$W = mg$

Gravity, $g = 9.81\ m/s^2$

$F_f = \mu F_n$

WORK, ENERGY & POWER

$W = Fs$

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

$PE = mgh$

$PEspring = \frac{1}{2}kx^2$

$P = Fv = \frac{W}{t}$

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

ROTATIONAL MOTION & KINEMATICS:

$\omega = \omega_0 + \alpha t$

$\theta = \omega_0 t + 1/2\,\alpha t^2$

$\omega^2 = \omega_0^2 + 2\alpha\theta$

$\omega = \frac{\Delta\theta}{\Delta t}$

$T = \frac{2\pi}{\omega} = \frac{1}{f}$

$s = r\theta$

$v = r\omega$

$a = r\alpha$

$a_c = \frac{v^2}{r}$

$F_{centripetal} = \frac{mv^2}{R}$

Max shear stress, $\tau_{max} = \frac{Tc}{J}$

Polar moment of inertia, $J = \frac{\pi}{2}c^4$

IMPULSE, MOMENTUM & COLLISION

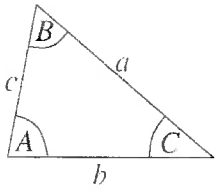
Impulse, $J = Ft$

Momentum, $p = mv$

$KE_{before} = KE_{after}$

$m_A v_A + m_B v_B = m_A u_A + m_B u_B$

TRIGONOMETRY



SINE RULE:

For finding sides:

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

For finding angles:

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

COSINE RULE:

For finding sides:

$a^2 = b^2 + c^2 - 2bc\cos(A)$

$b^2 = a^2 + c^2 - 2ac\cos(B)$

$c^2 = a^2 + b^2 - 2ab\cos(C)$

For finding angles:

$$\cos(A) = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos(B) = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos(C) = \frac{a^2 + b^2 - c^2}{2ab}$$