BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF SCIENCE AND ENGINEERING

AEH105

Department of Engineering and Physics

Bachelor of Science (Honours) Degree in Agricultural Engineering

Engineering Mechanics

3 HOURS (100 Marks)

INSTRUCTIONS

NOV 2024

1. The paper contents 6 questions
2. Answer any **FOUR** questions. Each carries **25 marks**

Question 1

Fig. Q1 represents a box acting on four forces (A=50 kgf; B= 650N; C= 0.1 kN and D = 30 kgf), determine:

a) the resultant force acting on the body, [9 marks]
b) the direction and sense of the resultant force. [16 marks]

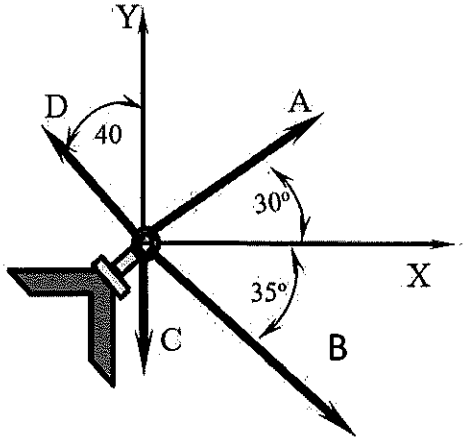

Fig. Q1

Question 2

Three horizontal forces are applied to the arm of a machine, as indicated in the Fig. Q2.

a) determine the value of P. [[9 marks]
b) Calculate the value of the reaction force at A in the X axis. [8 marks]
c) Determine the moment at point A, if P is 2 000 N. [9 marks]

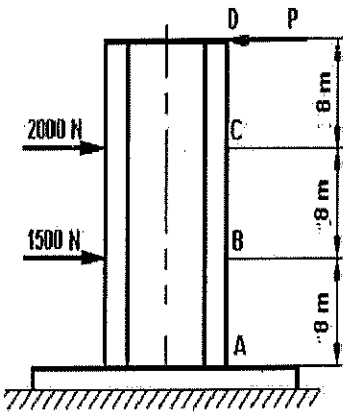

Fig. Q2

Question 3

In the truss represented (Fig. Q3).

a) Determine the reaction forces in C and D for Y direction. [8 marks]

b) Calculate the reaction force C for X direction. [7 marks]

c) Using the method of knots, determine the forces in bar CA and CD. [10 marks]

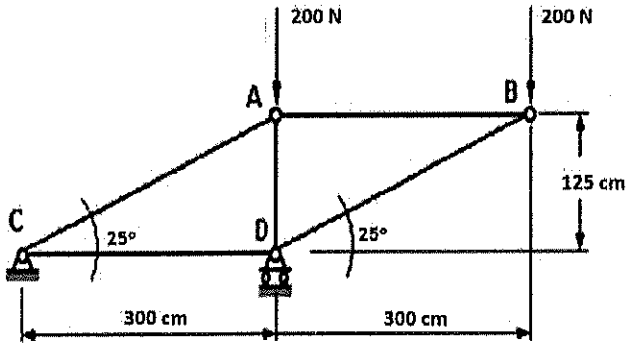

Fig. Q3

Question 4

With reference to Fig. Q4.

a) Determine the coordinates of the centre of gravity. [15 marks]

b) Locate it in cardinal system (X, Y). [10 marks]

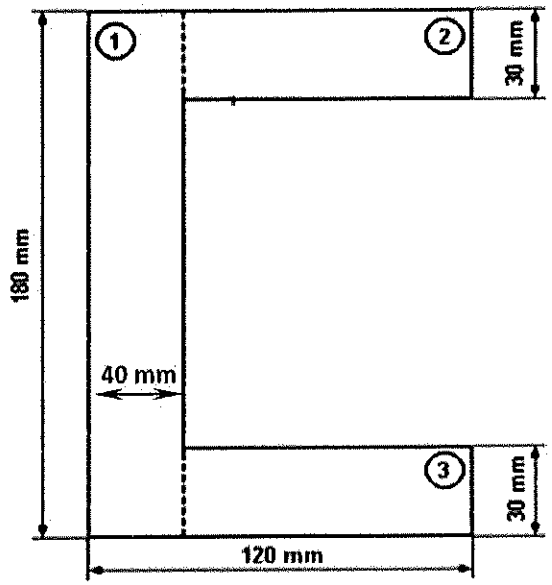

Fig. Q4

Question 5

A beam is loaded as shown Fig. Q5, with two concentrated forces, 105 and 200 N, respectively.

a) Draw the bending moment diagram of the beam. [13 marks]

b) Support your results with mathematical arguments. [12 marks]

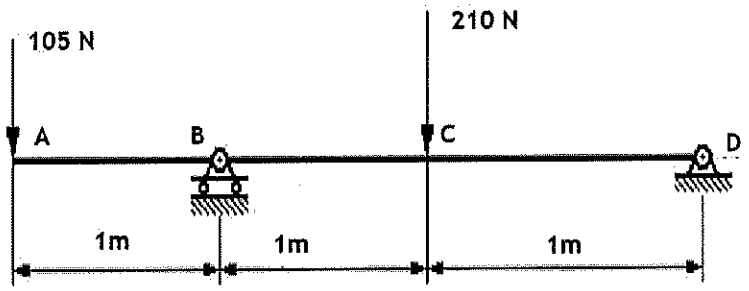

Fig. Q5

Question 6

A sliding door with a weigh 25 kgf is mounted on a horizontal track as shown in the Fig. Q6. The coefficient of static friction between the rail and the door at points A and B is 0.15. Determine:

a) The equilibrium equations. [5 marks]

b) The normal forces at points A and B. [8 marks]

c) The force P, required to overcome the friction between the track and the door and move from the right to the left. [12 mark]

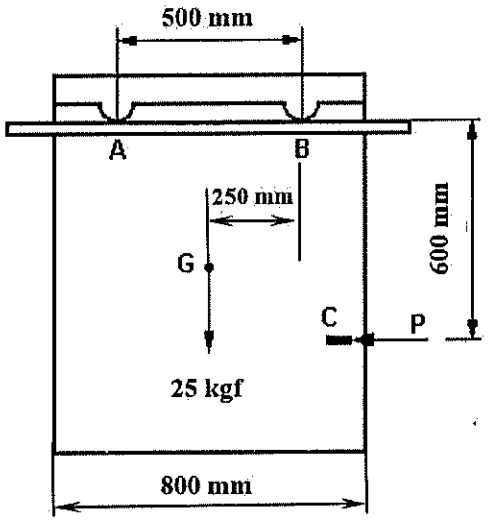

Fig. Q6

End of paper