NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF THE BUILT ENVIRONMENT

DEPARTMENT OF QUANTITY SURVEYING

APPLIED STATICS AND DYNAMICS

AAR 1206

Supplementary Examination Paper

August 2024

This examination paper consists of 4 printed pages

Examiner's Name   : Eng. Mudhindi
Time Allowed   : 3 hours

Total Marks   : 100

INSTRUCTIONS
Candidates should answer **ALL** questions.

MARK ALLOCATION

QUESTION		MARKS
1		25
2		25
3		25
4		25

Question One

(a) For the beam and loading shown below (Figure 1)

I.   Draw the shear force and bending-moment diagrams   (20)

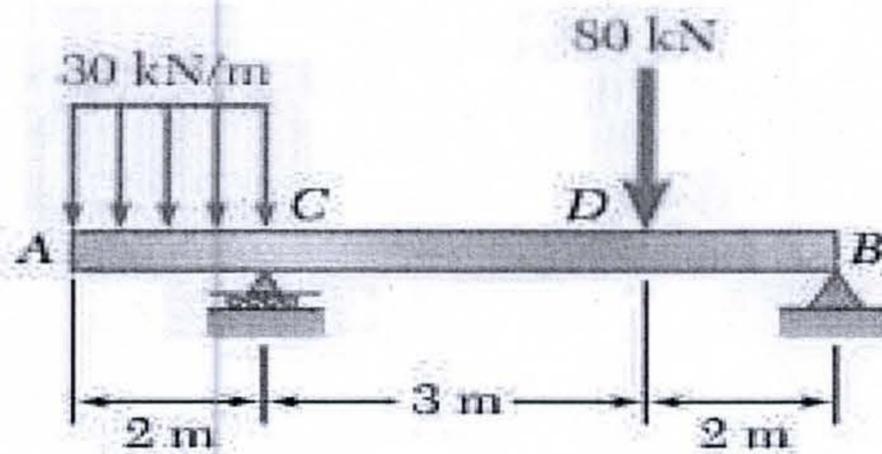II. Determine the maximum absolute values of the shear and bending moment   (5)

Figure 1

QUESTION Two

(a) The **table 1** below shows the results of an experiment where a force was applied to a sample of metal.

Table 1

Strain / 10^{-3}	0	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
Stress /10^8 Pa	0	0.90	2.15	3.15	3.35	3.20	3.30	3.50	3.60	3.60	3.50

i.   On graph, plot a graph of stress against strain using the data in table **1**.   (15)

ii. Use your graph to find the Young modulus of the metal   (5)

(b) A Circular rod of diameter 20mm and 520mm long is subjected to a tensile force of 40KN.The modulus of elasticity for steel may be taken as 205kn/mm2 . Calculate stress ,strain and elongation   of the rod due to applied loads (10)

(c) A manufacturer of springs tests the properties of a spring by measuring the load applied each time the extension is increased. The graph of load against extension is shown below.

QUESTION THREE

a) State any three (3) structural forms and their applicability. (15)

(b) Determine the force in each member of the roof truss shown in **Figure 2** stating whether each member is in tension or compression (10)
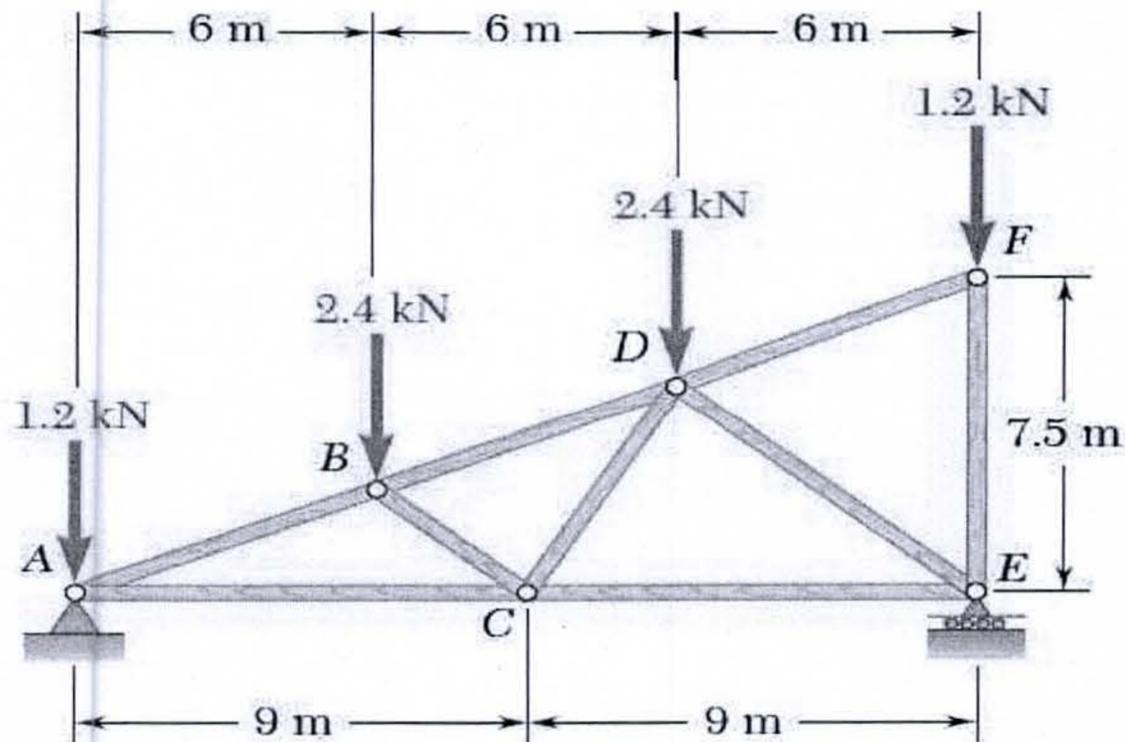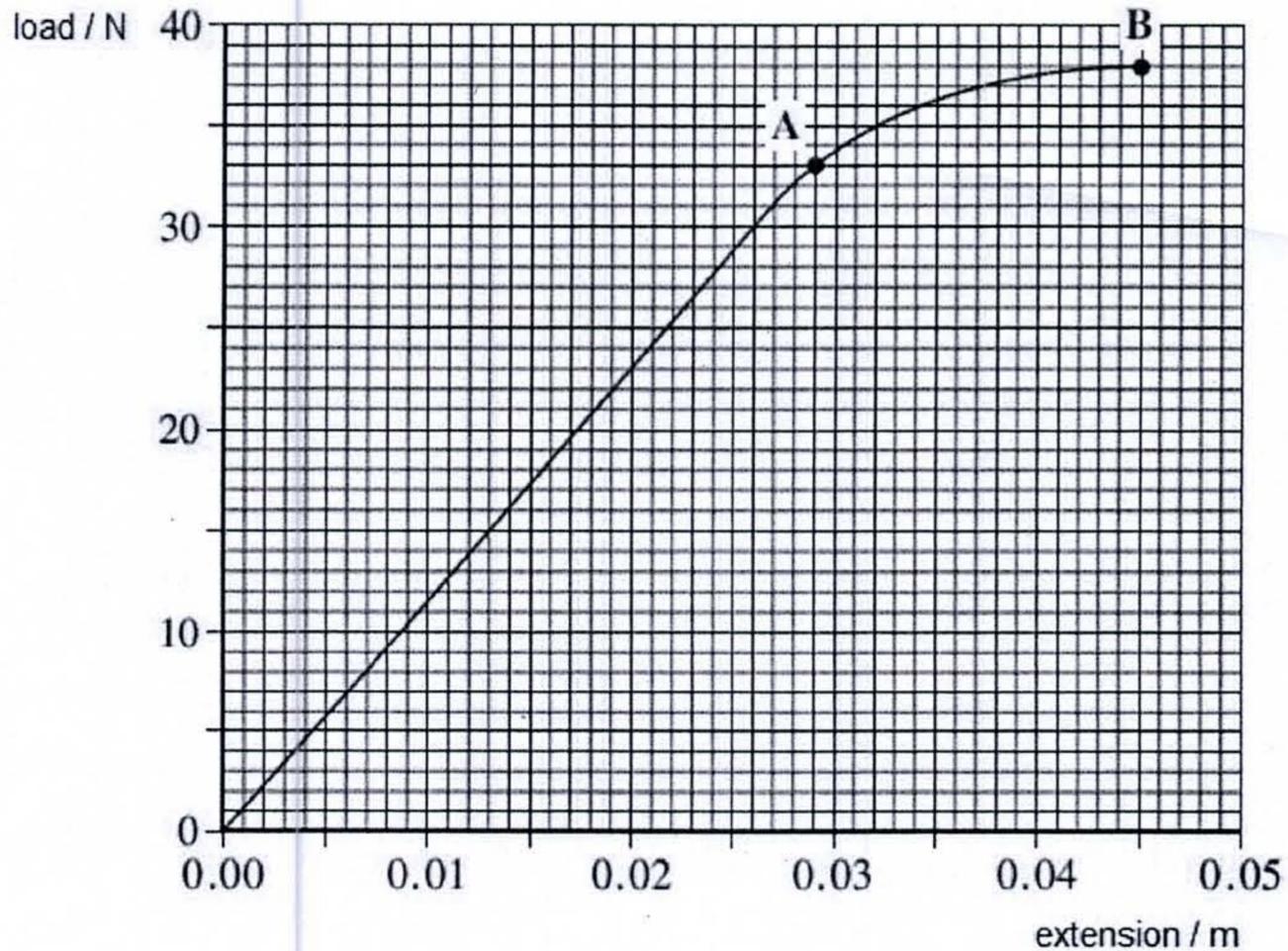

Figure 2

QUESTION FOUR

i. State Hooke's law and explain (5)

ii. Calculate the spring constant, k, for the spring. State an appropriate unit. (5)

iii. Beyond point A the spring undergoes plastic deformation. Explain the meaning of the term plastic deformation. (5)

iv. When the spring reaches an extension of 0.046 m, the load on it is gradually reduced to zero. On the graph above sketch how the extension of the spring will vary with load as the load is reduced to zero. (5)

v. Without further calculation, compare the total work done by the spring when the load is removed with the work that was done by the load in producing the extension of 0.045 m. (5)

END OF EXAMINATION