Engineering Studies
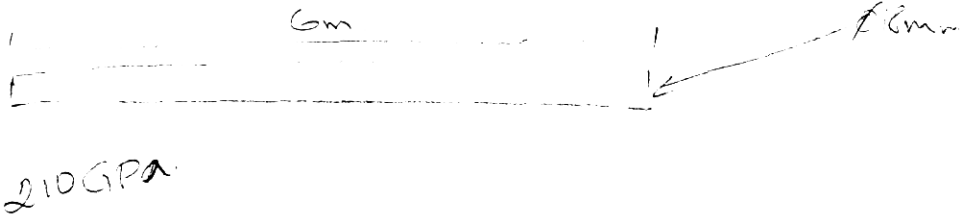
Section II (continued)

Marks

Question 12 — Civil Structures (10 marks)

(a)   A pre-stressed concrete beam is to be used in the construction of a ferry wharf.

The steel tendons used to pre-stress the beam are 18 mm in diameter and 6 metres in length. A force of 30 kN is to be applied to each tendon.

(i)   If the Young's modulus for the steel used in the tendons is 210 GPa, calculate the extension of each tendon.   **2**

6m

6cm

210GPA

Extension = ...

(ii)   Explain TWO benefits of using pre-stressed concrete beams in preference to reinforced concrete beams.   **2**

prestressed concrete is stronger than re-inforced concrete

....

....

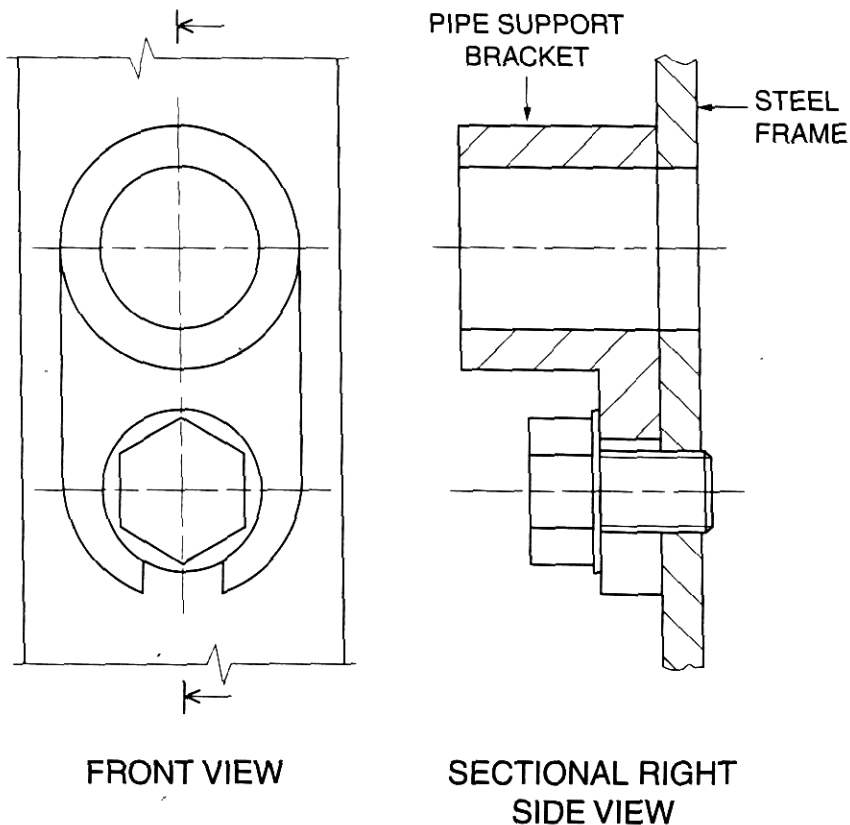..

Question 12 continues on page 12

Question 12 (continued)

    (iii) A timber-laminate beam is an alternative to the pre-stressed concrete beam. Discuss TWO factors, other than strength and cost, an engineer would consider in choosing the best option.   3

how easy the material is to use
how easy to manufacture the material
needs to be considered. if the material
can be manufactured on site, then its
easier to be transported.
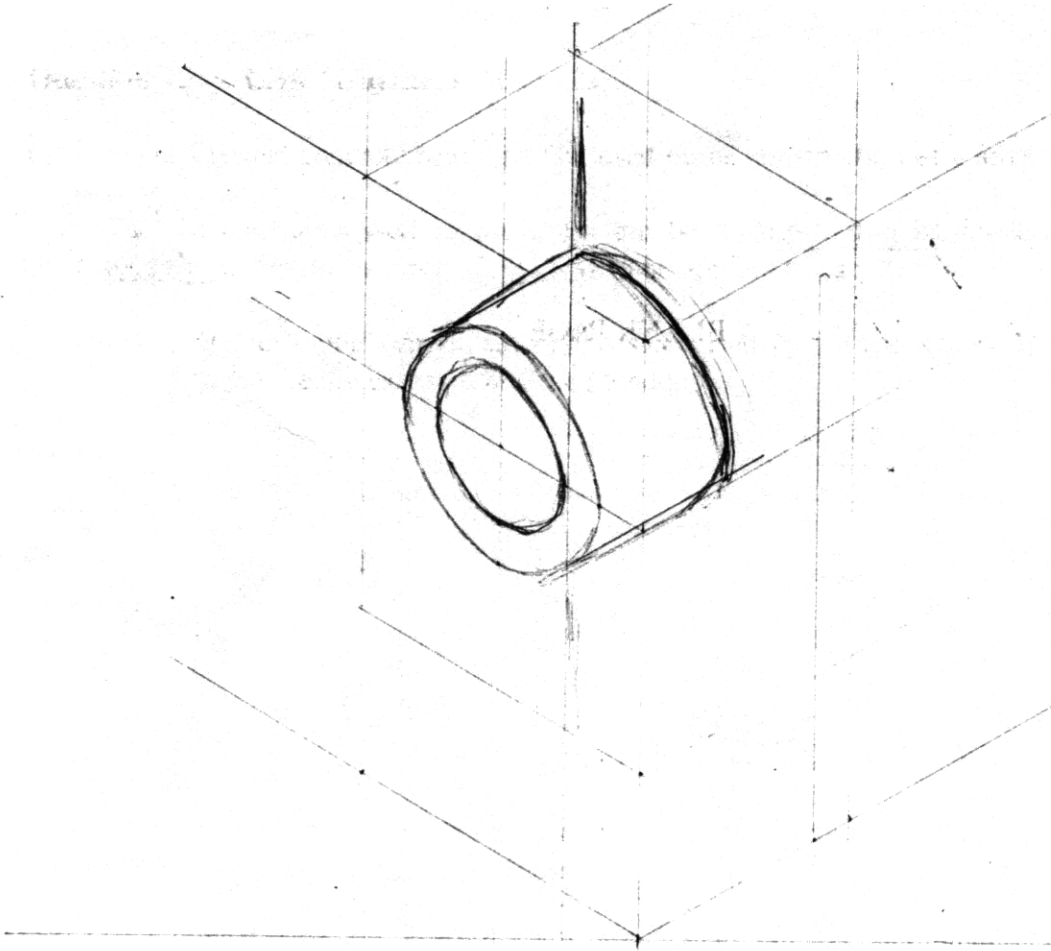
(b) The following orthogonal assembly drawing gives details of a pipe support bracket attached to a steel frame, drawn to a scale of 1 : 1.   3

PIPE SUPPORT
BRACKET

STEEL
FRAME

FRONT VIEW   SECTIONAL RIGHT
SIDE VIEW

On page 13, sketch a full-size pictorial view of the bracket and frame when viewed from the front. Do NOT include hidden outline. Do NOT section the sketch.

End of Question 12