

WORKSHOP CALCULATION AND SCIENCE

Time : 3 Hours

Marks : 50

Note : Attempt FIVE questions in all. Question No. 1 is COMPULSORY. All questions carry EQUAL marks.

1. (a) Fill in the blanks
- (i) HP = Watts.
 - (ii) If "a" is the semi-major axis and "b" is the semi-minor axis of an ellipse, then the area of the ellipse is
 - (iii) Surface area of a CUBE of side "a" is
 - (iv) SI unit of STRESS is
 - (v) If $\sin 2\theta = \cos 2\theta$, then the value of $\theta =$
- (b) State the DEFINITION of the following :
- (i) Newton's third Law of motion ✓
 - (ii) Specific gravity
 - (iii) Hooke's Law
 - (iv) Poisson's Ratio ✓
 - (v) Coefficient of Friction.

2. (a) Find the root of "X" of the following equation :
- $$X^2 - 7X + 10 = 0$$

- (b) (i) Derive the expression for area of an equilateral triangle having side "a"
 (ii) If the height of a cube is 5 cm., what is the volume of the cube ?

3. (a) Write the three different equations of motion. If a body falls freely from an height of 24m. At what velocity it will strike the ground ? What is the time taken by the body to reach the ground ? (Take $g = 9.81 \text{ m/sec}^2$).
- (b) Draw the shear force and bending moment diagram of Fig. 1. What are the reaction forces at the support A and B ?

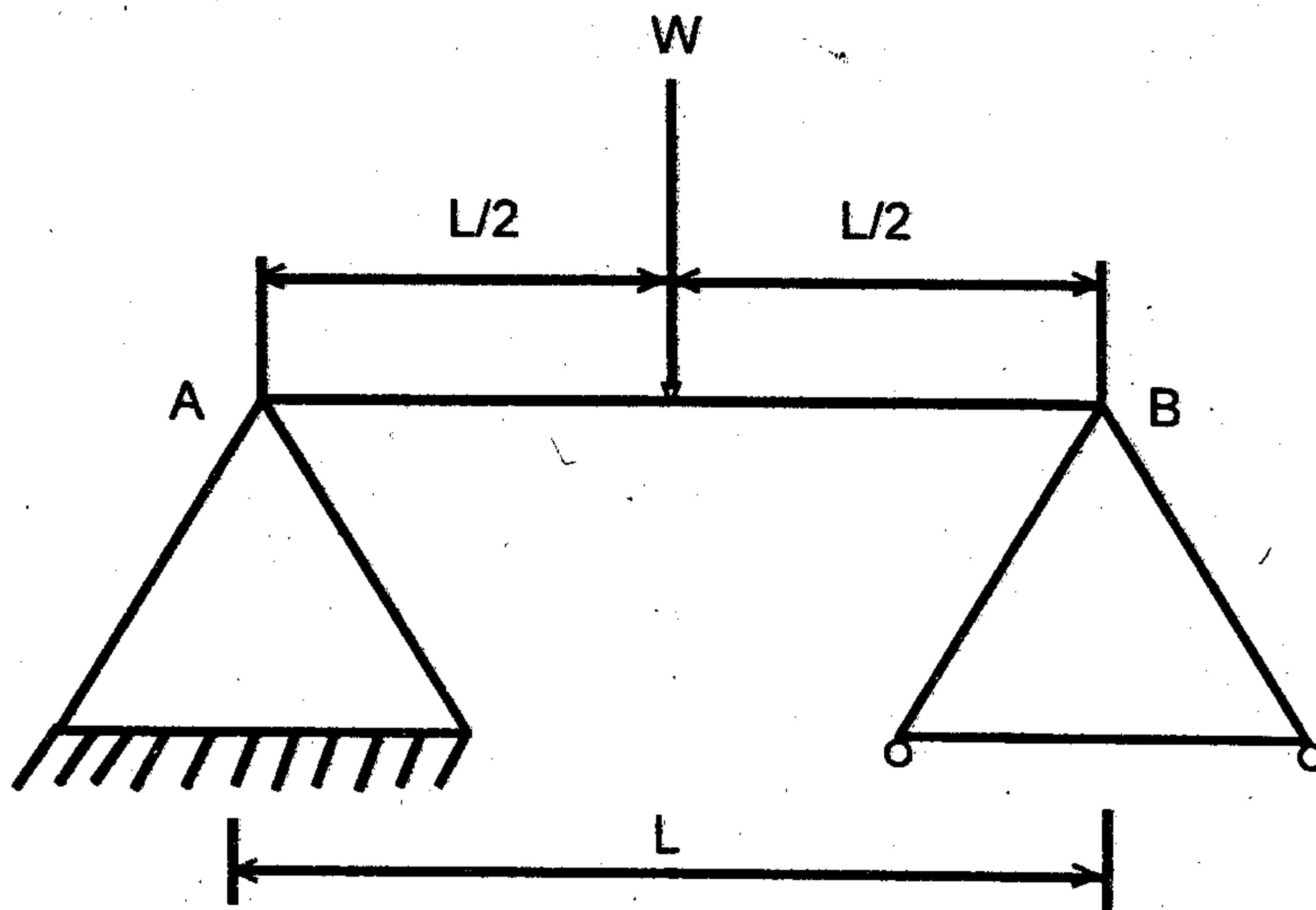


Figure 1

4. (a) What are the three different kinds of steel and specify the percentage of carbon for each ?
- (b) In a cooler 5 Kg. of hot oil enters at a temperature of 90°C and leaves at 30°C . At the other end of the cooler 10 kg. of water enters at 25°C . At what temperature water will leave the cooler ?
Take $C_{p\text{water}} = 4.2 \text{ KJ/KG-K}$, $C_{p\text{OIL}} = 2.7 \text{ KJ/KG-K}$.

5. (a) Write the difference between Insulator and Conductor. Find the amount of current flowing through a conductor of resistance of 40 ohm when connected through a potential difference of 40 V ?
- (b) A body is travelling from A to B at an initial velocity of 10 m/s. Distance between A and B is 100 m. It takes 5 sec. to reach from A to B. Find the acceleration of the body ?

6. (a) The cost of 2 pencils and 3 pens is Rs. 25. Cost of 5 pens and 8 pencils is Rs. 65. What is the cost of 1 pen and 1 pencil ? 5

(b) (i) $\log 8 + \log 16 + \log 32 = ?$, 2.5

(ii) $4 \times 3 - 12 \div 2 + 7 = ?$

7. Write short notes on any FOUR of the following :

(i) Pressure gage

(ii) Longitudinal stress in pipe

(iii) HSS

(iv) Horse power

(v) Simply supported beam

(vi) Factor of Safety.