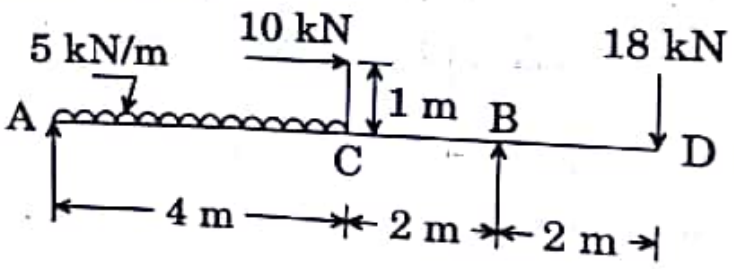
6. (a) In a roof truss, the member consists of 2 ISA 100 × 75 × 8 mm. Th angles are connected to either side of a 10 mm gusset plate ar member is subjected to a working pull of 280 kN. Design th welded connection assuming they are made in the workshop. Th centre of gravity of the section from the top may be considered 31 mm.

(b) Draw the shear force and bending moment diagram for the bea as shown below :



(c) Define the following terms :

Scrap value, Salvage value, Sinking fund and Depreciation

5. (a) A 6 m high vertical wall supports a saturated cohesive soil with horizontal surface. The top 3·5 m of the backfill has bulk density 18 kN/m^3 and apparent cohesion of 16 kN/m^2. The bulk density and apparent cohesion of the bottom 2·5 m is 19·5 kN/m^3 and 18 kN/m^2 respectively. What will be total active earth pressure on the wall ? Draw the pressure distribution diagram. Assume that tension cracks will develop. Locate the point of application of the resultant pressure. *20*

(b) A direct shear test was conducted on a silty sand. At failure the normal and shear stresses were found to be 66 kPa and 40 kPa respectively. Draw Mohr's circle and determine :

(i) Angle of shearing resistance

(ii) Principal stresses at failure

(iii) Locate the pole and find orientation of failure plane. *20*

(c) The pump-out test was performed to determine the field permeability of an unconfined aquifer and the following observations were made :

RL of original water table before pumping = 250·5 m

RL of water in the well at constant pumping = 245·6 m

RL of the rock of impervious layer = 220·0 m

RL of water in observation well = 249·8 m

The distance of observation well from tubewell = 48 m

Determine

(i) Coefficient of permeability of the aquifer (k)

(ii) Error in k if observations are not taken in the observation well and radius of influence is assumed to be 298 m

(iii) Actual radius of influence based on the observations of observation well

(iv) Radius of influence using Sichart equation

The diameter of the well is 20 cm and discharge is 250 m^3/hr. *20*