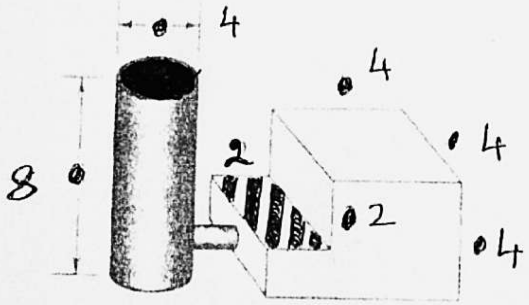
2nd Class Test: Casting Forming Welding
Time: 1 hour 15 minutes

Answer all questions in the answer script provided in the examination. Write your name and roll number in the answer script without which your answer script will not be evaluated. Assume any data if not given with suitable justification

Portion: Casting

C1a	What is center line feeding resistance? Explain with a suitable sketch	2
C1b	0.6 % carbon steel has following data for sand and chilled mold casting. Which will be difficult to feed? The start and end of freezing times at the centre line are 24 and 48 min for sand mold, and 8 and 10 min for chill mold. Assume liquid metal starts freezing at the mold wall as soon as it is filled.	3
C2	Figure shows a cylindrical riser attached during sand casting process. Compare the solidification times for each casting section and the riser and determine whether the riser will be effective. (All dimensions are in cms.) 	5
C3	The maximum equilibrium solubility of hydrogen at a partial pressure of 1 atm in liquid iron is 27 cm^3 per 100 gm. This drops to 7 cm^3 per 100 gm upon complete solidification. The density of iron (liquid and solid) is 7.9 gm/cm^3. Calculate the percentage of gas porosity in an iron casting if the partial pressure of hydrogen in contact with molten iron is 0.1 atm. What hydrogen partial pressure is required to eliminate the gas porosity?	5

Portion: Forming

F1	Derive the expression of force requirement in a deep drawing process with a given blank holding force.	10
F2	Why do the internal stresses get developed during austenitic to martensitic phase change?	5

Portion: Welding

W1	In the context of a fusion welding process, briefly discuss gas-metal reactions and its possible influence on the weld quality.	10
W2	Discuss the mechanism of keyhole welding of a butt joint using an electron beam	5