

Date: 28 FN / AN Time: 2 Hrs. Full Marks 60 No. of Students 112
 Autumn / Spring Semester, 2008 Deptt. Mechanical Engineering Sub. No. ME 30605
 3rd Yr. B.Tech. (H) / ~~B.Arch.~~ (H) / M.Sc. Sub. Name Casting, Forming and Welding

Instruction

ANSWER ALL THE QUESTIONS. FIGURES IN THE RIGHT HAND MARGIN INDICATE MARKS

1. Explain the following: [5x2=10]
 - (a) Does shrinkage allowance on a pattern depend on the pouring temperature of metal? How?
 - (b) Why castings produced in an investment casting process tend to have coarse grains?
 - (c) Why are aluminum alloys not suitable for centrifugal casting process?
 - (d) How would you select 'type of pattern' to be made for a given casting? Give examples.
 - (e) How does a pressurized gating system compare with an unpressurized system?

2. (a) In which respects foundry sands from two different sources could be different? Would those differences have any effect on the properties of the moulds produced? How? [6]
 - (b) Derive an expression to determine the 'rpm' of a vertical axis true centrifugal casting machine to be used for making steel pipes of outer diameter 'D' and length 'L'. [4]

3. (a) Find out the effective number of atoms in the following crystal structures: [4]
 - (i) FCC, and (ii) BCC
 - (b) Draw the iron-carbon equilibrium phase diagram with the peritectic, eutectic and eutectoid reactions. [6]

4. (a) Derive the pressure distribution in a single stage rolling operation. [5]
 - (b) A strip with a cross-section of $180\text{ mm} \times 8\text{ mm}$ is being rolled with 25% reduction of area, using 420 mm diameter steel rolls. Before and after rolling, the shear yield stress of the material is 0.6 kN/mm^2 and 0.7 kN/mm^2 , respectively. Calculate (i) the final strip thickness, (ii) angle subtended by the deformation zone at the roll center, and (iii) the location of the neutral point. Assume the coefficient of friction to be 0.2. [1+2+2=5]

5. (a) What are the typical defects formed during arc welding? Why spatter forms and how it can be minimized? [3+2=5]
 - (b) Why heat transfer efficiency is greater in arc welding processes with consumable electrodes? What are the two basic methods of arc shielding? Which metallurgical microstructure is harmful in M.S. welded joints? [3+1+1=5]

6. What are the typical modes of metal transfer in GMAW process? With sketch show how weld bead shapes are affected by the use of different gases in GMAW process? Explain arc blow and why it occurs? [3+4+3=10]

Indian Institute of Technology, Kharagpur

Date _____ FN/AN Time: 2 hours Full Marks: 30 No of Students: 21
Department: Humanities and Social Sciences
Five-Year Integrated M.Sc. in Economics Mid-Autumn Semester 2008-09
Subject Name: Public Finance and Policy Subject No: HS30079

Instructions: Answer all the questions.

1. Derive the marginal conditions of Pareto-optimality. Prove that the marginal conditions of Pareto-optimality are satisfied under perfect competition. (6+4)
2. Define public goods and elucidate their characteristics. Using Lindahl's voluntary exchange principle discuss how the optimum provision of a public good and distribution of the corresponding tax burden can be determined in an economy. (3+5)
3. What are objectives of taxation in an economy? Do you agree with the view that direct taxes are always superior to indirect taxes from welfare standpoint? Justify your answer. How can an increase in income tax rate affect tax revenue of the government? (2+3+3)
4. Write short-notes on any two of the following: (2×2)
 - (a) Balanced Budget Multiplier
 - (b) Externalities in Consumption
 - (c) Wagner's Law of Public Expenditure