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Thapar Institute of Engineering & Technology, Patiala
B.E. 3rd Year Mechanical Engineering
Sub: Manufacturing Technology (ME 002)
END Semester Examination, 8th December 2006

Time allowed: 3 hours

Max. Marks: 100

Course Instructor: Anirban Bhattacharya

Note:

Attempt any five questions.

Answer all the parts of a question in one place.

1. a) Explain the major properties of molding sand. (7)
b) Name some organic binders used for core making process and why they are preferred? (3)
c) Why distortion allowance is provided on the patterns? Why the internal surfaces require more draft allowance than external surfaces? (4)
d) What is the significance of the permeability testing in determining the casting quality to be achieved? (4)
e) Sketch and label (i) Drop Core, (ii) Sweep Pattern. (2)
2. a) Compare precision investment casting and shell molding from the stand point of process, product and application. (10)
b) Explain how ultrasonic inspection technique is used to distinguish different types of defects in casting? (4)
c) Describe the following types of casting defects mentioning their possible causes and remedial measures: (i) Hot tear, (ii) Scab, (iii) Misrun (6)
3. a) Name some common methods to manufacture powders to be used in powder metallurgical technique. Explain the procedure and significance of the sintering process. (2+4)
b) How the electrode diameter and electrode material can influence the spray type of metal transfer in Gas Metal Arc Welding process? (4)
c) What is rectification and what remedial measures can be taken to offset the effect of rectification in Tungsten Inert Gas welding? What is the significance of power source in breaking the oxide layers of metals? (7)
d) Explain the characteristics and application of constant current welding machine in arc welding. (3)
4. a) Write a short note on Friction and Inertia welding, with the help of neat sketches, mentioning the process parameter affecting the process. (6)
b) Describe the possible causes and the remedial measures of the following welding defects
(i) Weld Cracks (ii) Residual Stresses (5)
c) For a tool signature of 0-10-5-6-10-60-1 mm (ORS) during machining of carbon steel job of diameter 70mm, cutting conditions are feed = 36 mm/min, cutting speed $V_c = 39.6$ m/min and uncut chip width = 2.5 mm. Chip thickness measured as 1 mm and the coefficient of friction between chip and tool (μ) is 0.9. Assuming the shear strength of work material as 300N/mm², estimate the values of main cutting force and thrust force in Newton. (5)
d) Define tool life. Mention the tool life criterion for flank and crater wear of HSS and Carbide tools. (4)

5. a) When rake angle is zero during orthogonal machining, show that

$$\frac{\tau_s}{U_c} = \frac{(1 - \mu \cdot r)r}{1 + r^2}$$

where τ_s = shear strength of the work piece material, U_c = Specific cutting energy for main cutting force, μ = coefficient of friction between the chip and the tool and r = cutting ratio. (5)

- b) Derive the expression for the shear angle in terms of cutting ratio and the rake angle of the tool considering machining with single point turning tool. (3)
- c) With the help of neat sketches, explain the process of chip formation during metal cutting. Discuss different types of chip formed in turning, the favorable conditions for them, their relative advantages and disadvantages. (8)
- d) Differentiate between up milling and down milling. Why down milling operations are not attempted unless the machine is properly designed for this? (4)
6. a) Explain, with the help of neat sketch, explosive forming technique. Explain the operations involved in drop forging process with the help of suitable diagrams. (5+5)
- b) Differentiate between hot and cold working process mentioning relative merits and demerits. (4)
- c) Write the characteristics and application of any two types of oxide ceramics. (4)
- d) Why diamonds are not used as tool/ abrasive material during machining/ grinding of ferrous materials? (2)
7. a) What are the most common fillers used as additives in plastics? Why Plasticizers and Stabilizers are added in polymers? (4)
- b) Differentiate between addition and condensation polymerization process for plastics giving suitable examples. (4)
- c) Explain Vitrified and Resinoid bonding technique to form grinding wheel. (5)
- d) Define wheel loading and what is its effect on grinding process? With the help of neat sketch, explain centre less grinding process. (3+4)