

2123
M.E. (Mechanical Engineering)
First Semester
Elective – I
MME-105(b): Manufacturing Science

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, selecting atleast two questions from each Section. All questions carry equal marks.

x-x-x

SECTION-A

- 1 (a) Describe the influence of various alloying elements on mechanical properties of Aluminium and Titanium alloys.
b) What is Hall-Petch relation? Explain the significance of grain boundaries, grain size distribution, grain shapes and orientation used in the application of mechanical strength and high temperature/creep applications.
- 2 (a) Explain the mechanism of tool wear during machining process. Compare the wear characteristics of conventional cutting tool materials.
b) What do you mean by the economics of metal cutting? Derive an expression for optimum cutting speed for maximum production rate. Assume suitable assumptions.
- 3 (a) Derive an expression for thrust force at the chisel edge zone of a twist drill.
b) Estimate the cutting components of the machining force during the orthogonal machining of an aluminum alloy with an uncut thickness of 0.15mm, width of cut being 2.5 mm.
- 4 (a) A metal cutting test results indicates that for a given operation the optimum rake should be 10° . For convince of chip flow a $2-3^\circ$ of inclination angle is recommended. What is the back rake and side rake of this tool, if principle cutting edges angle is 60° ?
b) Explain the effect of cutting variables on chip reduction coefficients.

SECTION-B

- 5 (a) What are the effects of grain size and size distribution of the sand on main properties of moulding sand?
b) What are the types of cores used in green sand mould casting?
- 6 (a) Prove that h/d ratio of most compact economical riser for side placed riser is 1 and that for top placed riser is $\frac{1}{2}$ and that in both cases, ratio of volume/area is d/6.
b) What do you understand by metal penetration? Discuss its causes and remedies.
- 7 (a) Define welding arc? Explain the mechanism of arc initiation and its maintenance?
b) What is arc blow? Describe in brief the factor which causes the arc blow?
- 8 (a) Why coating of electrode is necessary? What are the different types of coating? Explain in brief.
b) Write short notes on:
(i) Electron beam welding
(ii) Epitaxial growth in weld metal solidification
(iii) Heat affected zone

x-x-x