M.E. Mechanical Engineering First Year Second Semester Examination- 2019
SUBJECT: ADVANCED MANUFACTURING SCIENCE

Time: 3 hours   Full Marks: 100

<u>Assume any data only if needed</u>
<u>Answer any FIVE questions</u>

Q.1 (a) with a neat sketch describe the cold chamber die-casting process.

(b) "The size of gates should be neither too small nor too large". Discuss the statement.

[14+6]

Q.2 (a) Calculate the optimum pouring time for a casting whose mass is 20 kg and having an average section thickness of 15mm. the materials of the casting are grey cast iron and steel. Take the fluidity of iron as 28 inches.

(b) Calculate the size of a cylindrical riser (height and diameter equal) necessary to feed a steel slab casting of dimensions 25 cm x 25cm x 5cm with a side riser, casting poured horizontally into the mould. Constant for Caine's equation for steel: a= 0.10, b=0.03, c=1.0   [10+10]

Q.3 (a) with a neat sketch describe the submerged Arc-welding process.

(b) The arc length-voltage characteristic of a dc arc is given by the equation $V=24 + 4I$, where V is the arc voltage and 'I' is the arc length in mm.

The static volt-ampere characteristic of the power source is approximated by a straight line with no load voltage of 80 volts and the short- circuit current of 600 amperes. Determine the optimum arc length for maximum power.   [10+10]

Q.4 (a) Calculate the total cost of manual flux shielded metal arc welding using the data given below weld length = 2 meters, welding speed = 12m/hr, operating factor =30%, labour and overhead charges/hr =Rs 25, electrode consumption=0.35 kg/meter, electrode price =Rs 20/kg, Arc voltage =22 volts, Arc current =200 Amps, Efficiency of welding machine (E) =0.6, Rate per kwhr =RS 0.80

(b) Explain the process of metal transfer, other than spray in GMAW Process with neat sketches.
[10+10]

Q.5 (a) Estimate the time required for making an open tank of size 40 X 40 X 40 cm out of mild steel plates of sizes 40 x 40 x 0.5 cm by considering the following data:

i) Welding is to be done on inner sides only.

ii) Preparation and setting up time 25 minutes.

iii) Welding time/meter of weld 15 minutes

iv) Rest allowance 10%

If labour is paid at Rs 10/hr, find the labour cost

(b) Write a short note on voltage –ampere characteristics to design power sources in case of welding.

[12+8]

Q.6 (a) Briefly explain the principle of rolling with a neat sketch.

(b) What is angle of bite in rolling? On what factors does its value depend?

(c) Why for cold rolling, a four high rolling mill is usually used?

(d) What is meant by breakdown passes in rolling?

[8+4+4+4]

Q.7 (a) Explain the term weldability of a material.

(b) With a neat sketch describe a spot welding process having different materials but having the same thickness.

(c)Write the various welding defects. Give their reasons and suggest the remedies.   [3+7+10]

Q.8. Write a short notes on (any four)   [4x5=20]

i) Various casting defects

ii) Brazing and soldering

iii) Centrifugal Casting

iv) Aspiration effect

v) Centre line freezing resistance

vi) Directional solidification

vii) Effect of welding current on weld bead geometry

viii) Blanking and piercing