Total Pages—5

(Set-Q₁)

B.Tech-5th(M & M)
Fabrication of Materials

Full Marks : 70

Time : 3 hours

Answer Q. No. 1 and any five from the rest

The figures in the right-hand margin indicate marks

1. Answer the following in short : 2×10

   (a) What are the main advantages of casting process ?

   (b) Define sprue, gate, runner and riser.

   (c) What are the distinguishing features between a casting and pattern ?

   (d) Why cores are used ?

   (e) Why are organic binders preferred in core making ?

(2)

(f) Why natural sand is not suitable for moulding purposes ?

(g) What is flux ? Why is it essential to use it in some welding situations ?

(h) How is an arc obtained in arc welding ?

(i) Why is tungsten inert gas welding preferred for welding aluminum plates ? Give reasons.

(j) What are the differences between brazing and soldering ?

2. (a) Briefly explain sand moulding procedure with neat sketches. 5

(b) What are the different pattern allowances ? $2\frac{1}{2}$

(c) Calculate the optimum pouring time for a casting whose mass is 20 kg and having an average section thickness of 15 mm. The materials of the casting are grey cast -iron and steel. Take the fluidity of iron as 28 inches. $2\frac{1}{2}$

3. (a) A sand specimen with a permeability number of 200 takes 15 seconds to pass 2000 cm³ of air at a pressure of 5 g/cm². Calculate the height of the sand specimen. $2\frac{1}{2}$

   (b) Explain the formation of shrinkage cavities in steel castings. 3

   (c) What are chills and their effect on the feeding distance ? $2\frac{1}{2}$

   (d) Calculate the riser diameter for an annular cylinder of 30 cm outside diameter, 10 cm inner diameter and 30 cm height. 2

4. (a) Explain briefly casting defects that occur in sand castings. 5

   (b) Explain about shell moulding its advantages and limitations. 5

5. (a) What are the advantages and disadvantages of hot working and cold working ? 5

   (b) What are the different rolling defects ? 2

(c) For a punching operation, a cast-steel of 1·5 mm thickness is used. The diameter of the punch used in this operation is 30 mm. The shear strength of this material is known to be 250 MPa. Calculate the following :

    (i) Shear area

    (ii) Force acting on the punch.   3

6. (a) What is weld decay ?   5

   (b) Discuss defects in welding.   5

7. (a) In a given welding operation, the power source is at 20 V and current at 300 A. If the electrode travel speed is 6 mm/s. Calculate the cross-sectional area of the joint. The heat transfer efficiency be taken as 0·8 and melting efficiency 0·3. Heat required to melt the steel is 10 J/mm³.   5

   (b) The arc welding of 6 mm steel plates in butt welding is being carried out at as welding speed of 9 mm/s. The welding transformer is set at 25 V and the current flowing is 300 A. Taking the arc efficiency as 0·85, calculate

(5)

the temperature to which the plates should be preheated such that the critical cooling rate is kept below 6 °C/s at a temperature of 550 °C for satisfactory metallurgical quality. 5

8. (a) Superimpose the stress-strain curves for a ductile and brittle material. Represent the following on the above curves 5

(i) Youngs modulus

(ii) Elastic limit

(iii) 0·2% yield stress

(iv) Ultimate stress

(v) Fracture stress

(vi) Resilience and toughness.

(b) Define strain rate sensitivity and on what factors does it depend. Also derive expression for strain rate sensitivity. 3

(c) Define superplasticity. What is the value of m for materials exhibiting superplasticity ? 2