

CS/B.TECH(PWE)/SEM-8/PWE-803A/2012

2012

MANUFACTURING SCIENCE

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) Casting process used for ornaments and toys of nonferrous alloys is

- a) slush casting b) die casting
- c) pressed casting d) investment casting.

ii) Fettling is an operation performed

- a) before casting b) during casting
- c) after casting d) after heat treatment.

iii) Loam sand comprises

- a) 50% sand and 10% moisture
- b) 40% sand and 10% moisture
- c) 50% sand and 18% moisture
- d) 80% sand and 20% moisture.

iv) Cold working of metal increases

- a) tensile strength b) hardness
- c) yield strength d) all of these.

v) In rolling operations, the roll rotates with a surface velocity

- a) lower than the speed of incoming metal
- b) exceeding the speed of incoming metal
- c) equal to the speed of incoming metal

- d) none of these.
- vi) Swaging is opposite of
- a) forging
 - b) ring rolling combined with stretch forming
 - c) steam hammer forging
 - d) piercing.
- vii) In a welding, a flux is used
- a) to permit perfect cohesion of metals
 - b) to remove the oxides of the metals
 - c) both (a) and (b)
 - d) none of these.
- viii) Material difficult to be spot welded is
- a) stainless steel b) copper
 - c) mild steel sheet d) all of these.
- ix) In arc welding, penetration is minimum for
- a) DCRP b) DCSP
 - c) AC d) none of these.
- x) The residual stress in a surface machined by ECM is almost in the order of
- a) 0 (zero) b) 10 kg/mm²
 - c) 25 kg/mm² d) 50 kg/mm².
- xi) Mechanism of material removal by EBM is
- a) shearing b) electrolysis
 - c) melting/vaporisation d) brittle fracture.
- xii) TIG welding is preferred for
- a) mild steel b) aluminium
 - c) silver d) all of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Briefly discuss about the various types of pattern allowances.

3. a) Name the different elements of gating system of a casting.
- b) Why is a sprue tapered down ? 2 + 3
4. a) What is forming ? Classify it.
- b) Describe any one of the different forming processes briefly. (1 + 1) + 3
5. Briefly discuss about the different zones in an electric arc during arc welding.
6. Discuss about the working principle of ECM.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Determine the solidification time of the following two iron castings when both are poured, with no superheats, into sand moulds at the initial temperature of 28°C .

i) A slab shaped casting of 15 cm thickness

ii) A sphere of 14 cm diameter.

Data for iron are : $Q_f = 154^\circ\text{C}$, $L = 272 \text{ kJ/kg}$,

$$P_{\text{iron}} = 7850 \text{ kg/m}^3.$$

Data for sand are : $C_p = 1.17 \text{ kJ/kg K}$,

$$K = 0.8655 \text{ W/m-k}, \quad \rho = 1600 \text{ kg/m}^3.$$

b) The figure shown below is of a mould along with the riser for casting a plate $20 \text{ cm} \times 20 \text{ cm} \times 5 \text{ cm}$.

Determine the area A_g such that the mould and the riser get filled up within 10 seconds after the down sprue has been filled. It should be noted that $A_3 \gg A_g$ since below the down sprue, a flat gate is attached to casting. Neglect the friction and orifice effects.

7 + 8

8. a) With a neat sketch describe deep drawing.

b) A strip of lead with initial dimensions $24 \text{ mm} \times 24 \text{ mm} \times 150 \text{ mm}$ is forged between two flat dies to a final size of $6 \text{ mm} \times 96 \text{ mm} \times 150 \text{ mm}$. If the coefficient of friction between the job and the dies is 0.15, determine the maximum forging force. The average field stress of lead in tension is 7 N/mm^2 .

c) Distinguish between punching and blanking. 7 + 6 + 2

9. a) With a neat sketch describe the process of MIG welding.

b) Discuss about the different modes of metal transfer in arc welding. 7 + 8

10. a) Describe the functions of electrolyte in ECM.

b) With a neat sketch, briefly discuss about an electrochemical machining plant. 5 + 10

11. Discuss about the various casting defects.

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