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Roll No. ....

**M.Tech (Production Engg.)**

**FIRST SEMESTER**

**SUPPLEMENTARY EXAMINATION**

**February-2019**

**ME-503 WELDING PROCESSES AND METALLURGY**

*Time: 3:00 Hours*

*Maximum Marks : 100*

**Note :** Answer **FIVE** questions.  
Assume suitable missing data, if any.

- 1[a] Welded structures have all the advantages over riveted structures. Despite they are not free from problems. Discuss. 10
- [b] Discuss the different types of coatings used in making covered electrodes. Give the approximate percentage range of various ingredients used for each type of coatings. Also give the salient features of each type. 10
- 2[a] The static volt-ampere characteristic of a welding power source is given by the equation:  
 $I^2 = -500(V-80)$   
and the arc characteristic is represented by the straight line equation:  
 $I = 23(V-18)$   
Determine  
(i) The power of the stable arc.  
(ii) If the arc length (l) and the arc voltage (V) are related by the expression  $V = 20 + 4.5l$ , determine the optimum arc length for maximum power.  
(iii) If the convective and radiative losses for the arc in (ii) be 15% of the arc power then determine if it will be advantageous to have an arc length of 4mm wherein these losses are only 20% of those for the arc in (ii).  
Comment briefly on the two cases. 15
- [b] What is Duty cycle? Enumerate the two main limitations of SMAW process in terms of its productivity. 5
- 3[a] Discuss the various modes of metal transfer in arc welding. 10
- [b] Discuss the self adjustment of welding arc and the type of power source, which will be selected for the purpose. Compare the features of argon and helium as shielding gas in gas shielded arc welding processes. 10

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- 4[a] Define the following processes:
- (i) Laser beam welding
  - (ii) Friction stir welding
- 10
- [b] How will you distinguish between thick and thin plate equation? Discuss the practical way of determining the critical cooling rate for a particular material. Find the best welding speed to be used for the welding of 6 mm steel plates with an ambient temperatures of 30°C with the welding transformer set at 25V and current passing is 300 A. The arc efficiency is 0.9 and possible travel speeds are 6 to 9 mm/s. The limiting cooling rate for satisfactory performance is 6° C/s at a temperature of 550°C. Assume thermal conductivity of the metal = 0.028 J/mm-s°C Volumetric specific heat = 0.0044J/mm<sup>3</sup>°C.
- 10
- 5 [a] Describe the welding properties and problems associated with welding of aluminium and its alloys.
- 7
- [b] Compare Magnetic particle inspection with ultrasonic inspection in respect of defects detected and advantages.
- 7
- [c] What are the defects that are generally found in welding? Explain any three weld defects with regard to their causes and remedies.
- 6
- 6 [a] Explain the complete procedure for constructing a TTT diagram (Isothermal decomposition of austenite).
- 15
- [b] What happens to welded joints if residual stresses are neglected? How can residual stresses be reduced?
- 5
- 7 Write short notes on any FOUR of the following
- [a] Gas tungsten arc welding
  - [b] Keyhole welding
  - [c] Electron beam welding
  - [d] Epitaxial grain growth
  - [e] Eutectic, eutectoid and peritectic reaction
  - [f] Weldability of stainless steels
- 20