

M.E. MECHANICAL ENGINEERING FIRST YEAR SECOND SEMESTER - 2024

Subject: ADVANCED MANUFACTURING SCIENCE

Time : 3 hours

Full Marks : 100

Answer Any Five questions

(Assume any data if needed)

- Q1. a) Define pattern. State the functions of a pattern. Enlist types of patterns. Discuss any three in detail.  
b) What is Core? What is the use of core prints?  
c) Explain various types of pattern allowances with sketch. [8+4+8]
- Q2. a) What is aspiration effect in casting?  
b) With a neat sketch, show full arrangement of TIG welding, the type of inert gas used in the process and the application. [5+15]
- Q3. A strip with a cross-section of 150 mm x 6 mm is being rolled with 20% reduction of area, using 400-mm-diameter steel rolls. Before and after rolling, the shear yield stress of the material is 0.35kN/mm<sup>2</sup> and 0.4 kN/mm<sup>2</sup> respectively.  
Calculate  
(i) the final strip thicknesses  
(ii) the average shear yield stress during the process  
(iii) the angle subtended by the deformation zone at the roll centre  
(iv) the location of the neutral point  $\theta_n$ .  
Assume the coefficient of friction to be 0.1. [20]
- Q4. a) What is gating system? Also explain their purpose.  
b) Explain with neat sketches the process of Metal Inert Gas Arc welding process and its application. [5+15]
- Q5. a) What are straight polarity and reverse polarity in arc welding?  
b) Explain different welding positions and welding joints.  
c) Explain with neat sketches the process of submerged arc welding process and its application. [4 +4+ 12]
- Q6. a) Name the possible welding defects and state their causes and possible remedies.  
b) Explain brazing and soldering process. [15+5]

[ Turn over

- Q7. The voltage length characteristic of direct current arc is given by ( $V = 20 + 40L$ ) volts, where  $L$  is the length of the arc in cm. The power source characteristic is approximated by straight line with open circuit voltage = 80 V and a short circuit = 1000 amp. Determine the optimum arc length and the corresponding arc power [20]
- Q8. a) Name the possible casting defects and state their causes and possible remedies.
- b) In a gating system design, a down sprue of 180 mm length has a diameter of 20 mm at its top end. The liquid metal in the pouring cup is maintained up to 60 mm height. What should be the diameter (in mm) of the down sprue at its lower end to avoid aspiration?

[15+5]