# BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE PILANI
## Second Semester 2022-23
### Manufacturing Processes (ME F219)
#### Comprehensive Examination (Regular, Closed Book)
#### Date: 20-05-2023

**Maximum Time: 180 min.**                              **Maximum Marks: 70**

*Note: Be succinct, no credit will be given for ambiguous answers. All parts of a question must be answered together and in sequence. Answer of a question must be started from a fresh page.*

## Q1.

a) Match the following entities for a correct pair (1:1).                                      [4]

| | |
|---|---|
| 1) Yellow colour | a) No finishing required |
| 2) Yellow strips on black | b) Surface needs machining |
| 3) Green colour | c) For machined opening |
| 4) Red colour | d) For loose core print |

b) Write down your answer **briefly.**

   i) Why is directional solidification not an issue for true centrifugal casting?      [3]
   ii) Why is a dummy bar required initially in continuous casting?      [3]
   iii) How is Bouschinger effect reduced in metal forming process?      [3]
   iv) What is the effect of back tension in rolling operation?      [3]
   v) How is bamboo defect reduced in extrusion operation?      [3]

c) A copper plate having dimension 20mm×20mm×160mm is forged between two flat dies to a final size of 10mm×40mm×160mm. Determine the peak forging force, assuming the coefficient of friction to be 0.2. The tensile yield stress of copper can be taken as 70 N/mm². Assuming that no strain hardening takes place during the process.      [6]

## Q2.

a) Match the following entities for a correct pair (1:1).                                      [4]

| | |
|---|---|
| 1) Seam welding | a) Mixing of materials in joint |
| 2) High frequency resistance welding | b) Similar and dissimilar metal joints |
| 3) Friction stir welding | c) Cylindrical pipe manufacturing |
| 4) Flash welding | d) Liquid tight joint manufacturing |

b) Write down your answer **briefly.**

   i) What is arc cleaning in welding? What kind of polarity will you recommend to improve arc cleaning during welding?      [3]
   ii) What is tungsten used as electrode material in TIG welding?      [3]
   iii) What is the role of argon gas during MIG welding of steel plate?      [3]
   iv) Why is a neutral flame extensively used in oxy-acetylene welding?      [3]
   v) What are the methods of avoiding lamellar tear defect in welding process?      [3]

c) The voltage-length characteristics of a DC arc is given by $V = (20 + 4l)$ volts where $l$ is length of the arc in mm. During a welding operation, it is expected that the arc length will vary between 4 mm and 6 mm. It is desired that the welding current will be limited to the range of 450-550 amp. Assuming a linear power source characteristic, determine the open circuit voltage ($V_o$) and short circuit current ($I_s$) of the power source. [6]

**Q3.**

a) Write down your answer **briefly.**

i) Why are helical cutting teeth preferred over straight cutting teeth during slab milling process? [3]

ii) Identify directrix and generatrix for a cylindrical hole produced by drilling operation with proper sketch? [3]

iii) Turning of a hollow cylinder in lathe can be considered as orthogonal cutting? Justify your answer with proper sketch. [3]

iv) Write down the two major differences between chill and chaplet for sand casting in tabular form. [3]

v) Cutting ratio ($r$) during metal cutting can be expressed as function of shear angle and rake angle tool? [3]

b) The magnitudes of cutting force and thrust force components in an orthogonal cutting operation are 1470 N and 1589 N respectively. The rake angle of the tool is 5°. The width of the cut is 5.0 mm. The uncut chip thickness and the chip thickness ratio are 0.6 and 0.38 respectively. Determine (a) the shear strength of the work material and (b) the coefficient of friction in the operation. [5]

***************************Best of luck***************************