Total No. of Questions : 10]

SEAT No. :

**P3675**

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# [4959]-1041

## B.E. (Mechanical Engineering)

## ADVANCED MANUFACTURING PROCESSES

## (2012 Pattern) (Semester - I) (End Sem.) (402045D) (Elective - II)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to candidates:***

1) ***All Questions are compulsory i.e. solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, and Q9 or Q10.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** a) Match the characteristics and /or application given on right hand side with the appropriate advanced manufacturing processes given on left hand side. **[4]**

| Advanced Manufacturing Processes | Process characteristics and/or applications |
|---|---|
| i) Electromagnetic forming | a) Use of eddy current |
| ii) Flow forming | b) Thin-walled, seamless rocket motor and missile castings |
| iii) Hydro forming | c) Radiator forms |
| iv) Roll forming | d) Work hardening, micro-cracks and thinning at bends |
| v) High velocity forming | e) Electrohydraulic forming |
| vi) High energy rate forming | f) Crimping of metal strips |
| vii) Explosive forming | g) Mostly water is used as a medium of energy transfer |
| viii) Shear spinning | h) Production of conical and axisymmetric parts |

***P.T.O.***

b) With a neat sketch explain the principle of friction stir welding (FSW)? Also, state the important process parameters which affect the performance of FSW. **[6]**

OR

***Q2)*** a) State whether the following statements are true or false: **[4]**

i) the spinnability of the material is dependent on the material to be shear form.

ii) In backward flow forming spun material flows under the roller in opposite direction of the feed motion of roller and towards the unsupported end of the mandrel.

iii) Electrohydraulic forming can be used to form poor conducting work materials.

iv) Large and thick parts can be economically and efficiently shaped by explosive forming in comparison to electromagnetic forming (EMF) process.

b) Describe with a neat sketch the different metallurgical zones in friction stir welding. **[6]**

***Q3)*** a) Write down the advantages and limitations of squeeze casting process (four each). **[4]**

b) With a neat sketch explain the principle of shaped tube electrolytic machining. Also, state the process parameters which affect the overall process performance. **[6]**

OR

***Q4)*** a) Explain the principle of laser heat treatment and name any four different types of laser sources used in heat treatment. **[4]**

b) With a neat sketch explain the principle of electrochemical grinding (ECG) process. Also, state the applications of ECG. **[6]**

***Q5)*** a) Describe with a neat sketch the principle of micro-ultrasonic machining process (micro-USM). Also, classify micro-USM process based on machine tool characteristics and different tool heads. **[8]**

b) Give the classification of micro-electric discharge machining (micro-EDM) technology used for manufacturing of micro features (Types of micro-EDM process). Also, state the advantages and limitations of micro-EDM process (four each). **[8]**

OR

***Q6***) a) Describe single point diamond turning in terms of its process characteristics, the machine tool, materials machined and from quality control aspects. **[8]**

b) State the principle of micro-electric discharge machining (micro-EDM) process with a neat sketch and give its four applications and two points of differences from EDM process. **[8]**

***Q7)*** a) What is additive manufacturing? State its benefits over subtractive manufacturing processes and also, name the seven categories of additive manufacturing processes with suitable applications of each category of additive manufacturing process. **[8]**

b) State the principle of powder bed fusion additive manufacturing process with a neat sketch. Also, state its advantages and limitations (four each).**[8]**

OR

***Q8)*** a) With neat sketches describe step by step material extrusion process and how, it differs from the sheet lamination process. Also, state the advantages and disadvantages of sheet lamination process (four each)? **[8]**

b) What is direct write technology (DW)? Give classification of DW technology and their applications. How this technology differs from 3D printing technology? **[8]**

***Q9)*** a) State the different types of electron microscopes and with a sketch explain in principle how electron microscopes get differ from optical microscopes? **[6]**

b) Explain with sketch the principle of online dimensional measurement using laser-based diffraction method technique. **[6]**

c) Explain with sketch the principle of scanning tunneling microscopy using constant current mode and constant height mode **[6]**

OR

***Q10)*** Write short notes on following micro machining measuring instruments: **[18]**

a) Atomic force microscope (AFM).

b) Interference comparators.

c) Optical microscopes.

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