Code : 102504

B.Tech 5th Semester Exam., 2020
(New Course)

MANUFACTURING PROCESSES

Time : 3 hours   *Full Marks* : 70

Instructions :

(i) *The marks are indicated in the right-hand margin.*

(ii) *There are NINE questions in this paper.*

(iii) *Attempt FIVE questions in all.*

(iv) *Question No. 1 is compulsory.*

1. Choose the correct answer of the following
   (any *seven*) :   2×7=14

   (a) The pattern used for mass production is

       (i) match plate pattern

       (ii) split pattern

       (iii) skeleton pattern

       (iv) single-piece pattern

   (b) The low permeability in sand can cause which of the following defects in casting?

       (i) Rough surface

       (ii) Blow holes

       (iii) Hot tears

       (iv) Drop

   (c) Power consumption in metal cutting is mainly due to

       (i) tangential component of the force

       (ii) longitudinal component of the force

       (iii) normal component of the force

       (iv) friction at the metal-tool interface

   (d) In orthogonal cutting test, the cutting force = 900 N, the thrust force = 600 N and chip shear angle is 30°. Then the chip shear force is

       (i) 1079·4 N

       (ii) 969·9 N

       (iii) 479·4 N

       (iv) 69·6 N

(e) In the grinding wheel of A60 G7 B23, B stands for

  (i) resinoid bond

  (ii) rubber bond

  (iii) shellac bond

  (iv) silicate bond

(f) Lathe bed is usually made of

  (i) structural steel

  (ii) stainless steel

  (iii) cast iron

  (iv) non-ferrous materials

(g) Which of the following types of stresses is/are involved in the wire drawing operation?

  (i) Tensile only

  (ii) Compressive only

  (iii) Both tensile and compressive

  (iv) Shear stress

(h) In rolling process, roller separating force can be decreased by

  (i) reducing roller diameter

  (ii) increasing roller diameter

  (iii) providing backup rollers

  (iv) increasing the friction between rollers and metal

(i) In straight polarity welding

  (i) electrode holder is connected to the negative and workpiece to positive

  (ii) electrode holder is connected to the positive and workpiece to negative

  (iii) workpiece is positive and holder is earthed https://www.akubihar.com

  (iv) holder is positive and workpiece is earthed

(j) Arc stability is better with

  (i) AC welding

  (ii) DC welding

  (iii) Both AC and DC welding

  (iv) specially designed waveforms

2. (a) What is cooling curve in metal casting? With neat sketch, explain the different regions of the cooling curve for a pure metal. 4

(b) Explain the interparticle friction associated with powder flow. With neat sketch, correlate the interparticle friction with angle of repose. 5

(c) In a metal cutting operation, chip thickness = 0·62 mm, feed = 0·2 mm/revolution and rake angle = 15°. Calculate—

(i) cutting ratio;

(ii) shear angle;

(iii) shear strain. 5

3. (a) Differentiate between up and down milling operations. 4

(b) Two castings of same material having similar surface area and in the shape of sphere and cube, find out the ratio of solidification time of sphere to that of cube. 5

(c) In a wire drawing operation, initial wire diameter is 5·5 mm and final diameter is 5 mm. The die angle is 16°, die land is 3 mm and coefficient of friction is 0·1. Calculate the drawing load if flow stress is 240 MPa. 5

4. (a) Calculate the force acting on the cope box for a casting of cast iron pipe of 12·5 cm outer diameter, 10 cm of inner diameter and length of 180 cm. The metal head is to be about 20 cm and moulding box size is $200 \times 25 \times 20$ cm^3. Assume the moulding sand and core material is same and having density of 0·0165 N/cm^3 and density of molten metal is 0·0771 N/cm^3. 6

(b) Describe the mechanics of rolling process and derive the expression for location for neutral plane and roller separating force. 8

5. (a) What is a grinding wheel? Explain the grinding wheel specification. 7

(b) Determine drawing stress to produce 20% reduction in a 10 mm diameter steel wire. The stress is given by $\sigma = 1300\, \varepsilon^{0.3}$ MPa, die angle = 12°, coefficient of friction = 0·09. Also calculate the power in the wire drawing when wire is moving through the die at a speed of 3 m/sec. 7

6. (a) In a metal cutting operation with a cutting speed of 50 m/min, tool life of 45 min was observed. When the cutting

speed was increased to 100 m/min, the tool life decreases to 10 min. Estimate the cutting for maximum productivity, if tool changing time is 2 min. 6

(b) In a machining operation, derive the expression for optimum cutting velocity and tool life for maximum production rate condition. 8

7. (a) Two 1 mm thick steel sheets are to be spot welded at a current of 5000 A. Assume $R_c = 200\ \mu\Omega$ and time = 0·2 sec. Calculate total heat generated. 4

(b) Explain the geometry of a twist drill using suitable figure. 4

(c) Classify the coating technology based on physical principles. Also highlight the criterion for selection of coating materials and processes. 6

8. (a) What is a CNC? Explain its salient features which makes the CNC more effective. 6

(b) State different types of solid-state welding. Explain any two types. 8

9. (a) Write a short note on rapid tooling. 6

(b) What is turret lathe? State and explain different types of turret lathe with suitable figure. 8

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