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National Institute of Technology Hamirpur  
Department of Mechanical Engineering  
End-Semester Examination (May 2023)  
Manufacturing Science and Technology-II (ME-322)

B.Tech. VI Semester

*Instruction: All questions are compulsory, weightages of marks are mentioned against the questions*

Time: 3 Hrs

Max. Marks: 50

- Q.1** Following data from the orthogonal cutting test is available: [10]  
Rake angle  $\alpha = 10^\circ$ , chip thickness ratio  $r = 0.35$ , uncut chip thickness  $t_1 = 0.51$  mm, width of cut  $w = 3$  mm, yield shear stress of work material =  $285 \text{ N/mm}^2$ , coefficient of friction at tool-chip interface =  $0.65$ . Determine cutting force, radial force, normal force on tool chip interface, shear force on tool.
- Q.2** In a drilling of 20 mm diameter hole in a M.S solid block of 25 mm thickness, the feed rate used is 0.25 mm/rev. The drill must be changed after making 10 holes if it is rotated at 250 rpm. But the drill can produce 50 holes if it is rotated at 200 rpm. How many holes can be produced if its rpm is 150? [8]
- Q.3** What are the different mechanisms that causes wear at the tool-chip and tool-workpiece interface in case of single point cutting tool, explain in brief? [7]
- Q.4 (a)** What are the different methods of determining electrochemical equivalent of an alloy, explain with suitable expressions? [5]
- (b)** Electrochemical machining is performed to remove material from an iron surface of  $20 \text{ mm} \times 20 \text{ mm}$  under the following condition: [5]  
Inter electrode gap = 0.2 mm, supply voltage (DC) = 12V, Specific resistance of electrolyte =  $0.2 \Omega \text{ mm}$ , atomic weight of iron = 55.85, valency of iron = 2, Faraday's constant = 96500 coulombs. Calculate the material removal rate in gm/s.
- (c)** Explain the material removal mechanism of electric discharge machining, also define the following terms in terms of EDM: [5]  
(i) cold emission (ii) avalanche motion of electrons.
- Q5. (a)** What are the reasons and its mitigation methods of smoking in electron beam based powder bed additive manufacturing [5]
- (b)** What do you understand by die swelling and bead ironing in FDM? [5]

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