UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B. TECH Mechatronics | **Semester – V**
Subject (Course): Manufacturing Technology | **Max. Marks: 100**
Course Code : MHEG 357 | **Duration: 3 Hrs**
No. of page/s: 2

Section A (20 marks)

Q1 Calculate the approximate percentage change in the life of the tool with zero rake angle used in orthogonal cutting when its clearance angle (ϒ) is changed from 10^o to 7^o. Given: Flank wear rate is proportional to cot ϒ.

Q2 With a neat sketch, name the type of fit occurring between a hole of dimension $9^{+0.015}_{+0}$mm & corresponding shaft with dimension $9^{+0.010}_{+0.001}$mm.

Q3 Differentiate between brazing & soldering along with their applications.

Q4 The following is the specification of a grinding wheel.

51 C 180 K 5 S 05

What does each term signify?

Section B (40 marks)

Q5 In orthogonal turning of an engineering alloy, it has been observed that the friction force acting at the chip tool interface is 402.5 N & the friction force is also perpendicular to the cutting velocity vector. The feed velocity is negligibly small in comparison to the cutting velocity. The ratio of friction force to normal force associated with the chip tool interface is 1. The uncut chip thickness is 0.2 mm & the chip thickness is 0.4 mm. The cutting velocity is 2 m/sec.

Calculate i) Shear force acting along the shear plane. (5)
ii) The rate of heat generation at the primary shear plane. (5)

Q6 Diffentiate between i) up milling & down milling along with the sketches. (5)

ii) Straddle milling & gang milling along with the sketches. (5)

OR

Q6 With the help of neat sketches, explain any 5 drilling related operations.

Q7 Write short notes on i) TIG welding ii) MIG welding. (5+5)

Q8 Define choke area. Differntiate between unpressurized gating & pressurized gating system. (2+8)

Section C (40 marks)

Q9 Calculate the limit sizes & tolerances for a 25 mm H8-f7 fit. 25 mm diameter lies in the diameter step range of 18-30 mm. The values for standard tolerances for grades of IT8 & IT7 are 25i & 16i respectively. The fundamental deviation for shaft designation f is $-5.5\ D^{0.41}$.
Also design gauges for checking a 25 mm H8-f7 fit.

Q10 i) Draw the Merchant's circle diagram & write the expressions for each force in terms of the resultant force. (10)

ii) In an orthogonal cutting experiment, a HSS tool having the following tool signature 0-10-7-7-10-75-1 has been used. Given width of cut = 3.6 mm; shear strength of the workpiece material = 460 N/mm^2, depth of cut = 0.25 mm, coefficient of friction at the tool chip interface is 0.7.

Calculate the shear plane angle for minimum cutting force. (10)

OR

Q10 i) Derive the expression $2\phi + \beta - \alpha = \Pi/2$ as given by Merchant, where the symbols have usual meanings. (10)

ii) In an orthogonal machining operation, the following data is given:
Uncut thickness = 0.5 mm, cutting speed = 20m/min, rake angle = 15^0, width of cut = 5mm, chip thickness = 0.7 mm, thrust force = 200 N, cutting force = 1200 N. Assume Merchant's theory, calculate the coefficient of friction at the tool chip interface & the % of total energy dissipated due to friction at the tool chip interface. (10)