UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: B.Tech PIE   Semester – VI
Subject (Course): Metal cutting and tool design   Max. Marks   : 100
Course Code   : IPEG 362   Duration   : 3 Hrs
No. of page/s: 2

SECTION A [20 Marks]

Note: Attempt all questions. Be brief and specific.

S. No.	Content	Marks	CO
Q1.	Write down the basic principles of design of a single point cutting tool.	5	CO3
Q2.	Draw the geometry of a twist drill with proper labelling.	5	CO3
Q3.	Differentiate between progressive die and compound die.	5	CO4
Q4.	Discuss various types of tool wear mechanisms.	5	CO2

SECTION B [40 Marks]

Note: Attempt all questions. Be brief and specific.

Q5.	For punching a 10 mm circular hole, and cutting a rectangular blank of 50 x 200 mm from a sheet of 1 mm thickness (mild steel, shear stress = 240 N/mm^2), Calculate, in each case : (i) Size of punch (ii) Size of die (iii) Force required.	10	CO4
Q6.	Discuss different types of Power presses.	10	CO4
Q7.	In an orthogonal cutting operation, the rake angle is 5˚, chip thickness before the cut is 0.2 mm and width of cut is 4.0 mm. The chip ratio is 0.4. Determine (a) The chip thickness after the cut, (b) Shear angle, (c) Friction angle, (d) coefficient of friction, (e) shear strain.	10	CO1
Q8.	Write down the assumptions and derive the expression of shear angle by Modified Merchant's theory. **Or** Write down the assumptions and derive the expression of shear angle by Lee shaffer's theory.	10	CO1

SECTION C [40 Marks]

Note: Attempt all questions. Be brief and specific.

S. No.	Content	Marks	CO

Q9.	Explain in detail the following with neat diagrams:
	    a) Universal general –purpose fixture
	    b) Reassemblable fixture.
	              Or
	    a) Special adjustable fixture
	    b) Universal adjustable fixture
		
		10
		10
		
		10
		10
			CO5

Q10.	(I) A drilling operation is to be performed with a 12.7-mm diameter twist drill in a steel work part. The hole is a blind hole at a depth of 60 mm and the point angle is 118˚. The cutting speed is 25 m/min and the feed is 0.30 mm/rev. Determine (a) The cutting time to complete the drilling operation, and (b) Metal removal rate during the operation, after the drill bit reaches full diameter. (II) Low carbon steel having a tensile strength of 300 MPa and a shear strength of 220 MPa is cut in a turning operation with a cutting speed of 3.0 m/s. The feed is 0.20 mm/rev and the depth of cut is 3.0 mm. The rake angle of the tool is 5˚ in the direction of chip flow. The resulting chip ratio is 0.45. Using the orthogonal model as an approximation of turning, determine (a) The shear plane angle, (b) Shear force, (c) Cutting force and feed force.	10 10	CO1