Paper Code: MME-207	**Roll No.**									

M.Tech.
(SEM II) EVEN SEMESTER EXAMINATION, 2015-16
PRODUCTION TECHNOLOGY

[Time: 3 hrs.] **[Max. Marks: 100]**

Note- Attempt All questions.

1. (a) Give suitable explanations for the following:- **[2x4=8]**

(i) Tungsten Carbide tools, generally, do not require coolants for machining of steels.

(ii) In machining operations, Coefficient of friction decreases with increasing shear angle and cutting speed.

(iii) Under dynamic loading situations of cutting tools, appropriate brittle fracture criterion should be based on maximum elastic strain energy.

(iv) The phenomenon of built up edge formation, in machining, is more predominant under low cutting conditions.

(b) A tool with 8^0 back rake and 45^0 side cutting edge angle is being used for orthogonal machining of steel. The following data has been recorded:

Fc = 240 kgf. Fc = 170 kgf, V_c = 100m/min, f = 0.1 mm/rev.

What side rake should be provided so that cutting is orthogonal? Compute the magnitude of μ, and the energy consumed in friction per unit volume of material being cut. Gives that: work diameter 150 mm, depth of cut-2.0 mm, chip reduction coefficient = 2.75. [**6]**

(c) With the help of neat sketches discuss the significance of following in machining operations:
Chip flow angle, Shear flow angle and effective rake angle. [**2x3=6]**

2. (a) From the first principle, show that the mean tool-chip interface temperature is a function of: specific cutting energy, cutting speed, undeformed chip thickness, and the thermal properties of the chip material e.g., thermal conductivity, specific heat and density. **[6]**

(b) In a tool wear test, the following values of tool lives were recorded. **[8]**

Tool life (min)	Cutting speed (m/min)
30	25.0
1.5	70.0

Tool cost/ edge -	0.5/-
Labour + overheads	15/hr
Loading & unloading	
Time/ pc	1.0 min
Tool changing time	3.00 min/tool
Work	250 mm long x 60 min dia
Feed	0.18 mm/min
Depth of cut	2.5 mm

Compute the optimum cutting speed for

(i) Min cost/ pc

(ii) Max production rate

(c) Give a list of sources of vibration in machining operations. Discuss, one of the possible mechanisms for self excited vibration (chatter) in machining operations. **[6]**

3. (a) A compressive load of 400 metric tonnes was applied to a well lubricated cube of metal of 80 mm side, and just caused yielding. What load would be required for yielding if the other sides were constrained by forces of 100 & 200 tonnes respectively? **[6]**

(b) Discuss the following with possible explanations:- **[1½ x 4 =6]**

(i) *Characteristics of primary and secondary mechanical working.*

(ii) Advantages & disadvantages of hot and cold working operations.

(iii) Strain rate and its effect of flow stress of metals.

(iv) Common High velocity forming methods & advantages of using high velocity for forming

(c) Approximately what forging load would be required to transform a 0.900 m long x 0.900 m diameter, cylindrical bloom in a square section of equal area. Tensile yield stress = 62 N/m^2. Assume plane strain, sticking friction. What load would be necessary if the friction is sliding type with $\mu = 0.03$? **[8]**

4. (a) Discuss the role of friction between roll and metal surface. What is the significance of forward slip? Discuss how the forward slip is related to friction in rolling. **[6]**

(b) Determine the power required to draw steel wire from 12.5 mm to 10 mm diameter at 100 m/min. Given $\mu = 0.1$, $\alpha = 4^0$, $\sigma_0 = 30$ kgf/mm^2 what maximum reduction can be achieved?
If a backpull of 5 kgf/mm^2 is applied what draw stress would be needed? **[10]**

(c) Give a list of defects in formed parts. Explain why it may be difficult to maintain dimensional tolerances in formed parts ? **[4]**

5. (a) Discuss the major defects or discontinuities that affect the weld quality.

(b) What is meant by thermal cutting of metals? Describe the salient features of the following:

(i) Oxyfuel gas cutting and

(ii) Plasma are cutting

(c) Discuss the advantages and limitations of submerged are welding

(d) Discuss the principle of solid state welding. Explain why does inertia welding differ from friction welding?

(e) Discus, how is laser welding different from electron beam welding? What are the advantages and limitations of laser beam welding. **[4x5=20]**