

Registration no:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

B.Tech  
PCMT4304

**6<sup>th</sup> Semester Regular / Back Examination 2016-17**  
**MECHANICAL WORKING AND TESTING OF MATERIALS**  
**BRANCH(S) : METTA, MME**

**Time: 3 Hours**

**Max Marks: 70**

**Q.CODE: Z185**

**Answer Question No.1 which is compulsory and any five from the rest.**  
**The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions: (2 x 10)**
- a) Draw the typical diagram for distribution of normal stress and longitudinal stress for compression between plates.
  - b) What is rubber hydro-forming?
  - c) Define Meyer's law.
  - d) What is nil ductility temperature?
  - e) Calculate the ultimate tensile strength of soft metal having depth of impression 't' is 2mm.
  - f) What are the different types of indentations frequently observed with a pyramid indenter?
  - g) Express the mathematical expression of the total energy supplied to the blow in a power drop hammer.
  - h) Draw the typical diagram of direct extrusion and indirect extrusion.
  - i) The fatigue limit of a 1045 steel is about  $300\text{MN/m}^2$  when the mean stress is zero. The tensile strength of this steel is  $750\text{MN/m}^2$ . Using the Goodman equation estimate the safe stress amplitude for 1045 steel for the situation of a mean stress of  $250\text{MN/m}^2$ .
  - j) What are the important parameters to characterize a given cyclic loading history?
- Q2 a) Using simplified theory of rolling, express the geometrical relationships of roll diameter, coefficient of friction and sheet thickness for solid and cylindrical bars. (5)**
- b) Determine the maximum possible reduction for cold rolling a 300mm-thick slab when  $\mu=0.07$  and the roll diameter is 600mm. What is the maximum reduction on the same mill for hot rolling when  $\mu=0.4$ ? (5)**
- Q3 a) Explain the mechanics of metalworking process for plastic deformation in the constant-volume relationship. (5)**
- b) Express the stresses acting on an element during strip drawing of a wide sheet. (5)**

- Q4** a) Differentiate the tension test and torsion test mathematically in terms of state of stress and strain. (5)  
b) Express two types of notched-bar test used for investigation of the brittle fracture of metals. (5)
- Q5** a) Explain the different types of non-destructive testing. (5)  
b) Explain mechanism of creep deformation. (5)
- Q6** a) Describe fatigue crack growth and propagation. (5)  
b) A mild steel plate is subjected to constant amplitude uniaxial fatigue loads to produce stresses varying from  $\sigma_{max}=180\text{MPa}$  to  $\sigma_{min}= -40\text{MPa}$ . The static properties of steel are Y.S=500MPa, T.S=600MPa, E=207GPa and  $Kc=100\text{MPa}\sqrt{\text{m}}$ . If the plate contains an initial through crack of 0.5mm, how many fatigue cycles will be required to break the plate? Given  $A=6.9 \times 10^{-12}$  and  $p=3$ . (5)
- Q7** Explain the types of rolling defects and their preventive actions. (10)
- Q8** Write short answers on any TWO: (5 x 2)  
a) Types of rolling mills.  
b) Differentiate hot working and cold working  
c)  $K_{ic}$ plane-strain toughness testing.  
d) Transition temperature curve