

Code No: C1501**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M.Tech I - Semester Examinations, April/May-2012****ADVANCED MECHANICAL ENGINEERING DESIGN****(MACHINE DESIGN)****Time: 3hours****Max. Marks: 60****Answer any five questions****All questions carry equal marks**

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- 1.a) Explain the various phases of the design process with the help of a Flow chart.
- b) Explain "Stress Concentration" with special reference to designing of machine elements. How do you propose to reduce the effect of stress concentration?
- 2.a) What are the important points to be considered while designing with plastics? Explain.
- b) Discuss the different approaches for concept testing of a new product.
- 3.a) Discuss the (i) Miner's rule, and the (ii) Manson's rule for computing the fatigue damage caused by overstressing of a component.
- b) Explain the Fracture Mechanics theory with suitable examples.
- 4.a) The force acting on a bolt consists of two components – an axial pull of 12 kN, and a transverse shear force of 6 kN. The bolt is made of steel FeE 310 ($S_{yt} = 310 \text{ N/mm}^2$), and the factor of safety is 2.5. Determine the diameter of the bolt using the maximum shear stress theory of failure.
- b) What are the different fatigue failure models? Explain with suitable examples.
- 5.a) What is Surface Fatigue Strength, and how is it determined? Explain.
- b) Distinguish between adhesive wear, abrasive wear, and corrosion wear by giving suitable examples.
- 6.a) What is the importance of material and process selection in value engineering? Explain.
- b) What are the different types of oil films that can exist between two mating surfaces? Discuss their effects on the surface failure.
- 7.a) Explain the difference between the criteria of design for limited cycles and design for multiple stress cycles, with suitable examples.
- b) Distinguish between the harmful and beneficial residual stresses. Mention, with suitable examples, where they would occur.
8. Write short notes on:
 - a) Design for safety and reliability
 - b) Dynamic contact stresses
 - c) Ergonomical considerations in engineering design.