USN | | | | | | | | | | 16MDE22

Second Semester M.Tech. Degree Examination, Dec.2017/Jan.2018
Advanced Machine Design

Time: 3 hrs.   Max. Marks: 80

Note: 1. *Answer any FIVE full questions, choosing one full question from each module.*
2. *Use of Approved Data Hand Book is permitted.*
3. *Missing data may be assumed.*

Module-1

1   a. State and explain Distortion energy theory. Derive the expression for failure criteria for the same. **(08 Marks)**
    b. A load on bolt consist of an axial pull of 8kN with a transverse shear force of 5kN. Find the diameter of the bolt if the F.O.S is 3 and yield strength of material of bolt is 400Mpa. Using maximum principal stress theory. **(08 Marks)**

OR

2   a. With the help of S-N curve explain :
        i) High cycle fatigue   ii) Low cycle fatigue and Endurance limit. **(08 Marks)**
    b. Explain the effect of Microstructure size effect, surface finish and frequency on S-N behaviour. **(08 Marks)**

Module-2

3   a. Explain Bauschinger effect, Transition Fatigue life and cyclic Hardening. **(08 Marks)**
    b. An unnotched circular rod with a diameter of 10mm is subjected to constant amplified bending at room temperature with S_m = 200MPa. The material is 4340 Quenched and tempered alloy steel with S_u = 1240 MPa, S_y = 1170MPa and S_y' = 1000MPa. If the rod is commercially polished, determine the value of S_a, S_{max}, S_{min} and R for fatigue life of 50,000 cycles. Given a correction factor S_f = 0.87. **(08 Marks)**

OR

4   a. Write short notes on :
        i) Stable cyclic stress-strain Hystersis loop
        ii) Stain based life approach to life estimation. **(08 Marks)**
    b. Explain the effects of various factors influencing the strain – life behavior. **(08 Marks)**

Module-3

5   a. Explain :
        i) Sigmoidal $\dfrac{da}{dN} - \Delta K$ curve   ii) Cyclic plastic zone. **(08 Marks)**
    b. What do you mean by plain –strain fracture Toughness? Explain the effect of temperature, crack length and applied stress on plain strain fracture Toughness. **(08 Marks)**

OR

6   a. Write short notes on :
        i) Notch Sensitivity and Notch factor   ii) Haigh diagram. **(08 Marks)**
    b. Explain Strain Energy Density or Glinka Rule. **(08 Marks)**

Module-4

7 a. Explain Palmgren – Miner Linear damage rule and compare with Nonlinear damage Theories. (08 Marks)

   b. Write short notes on :
      i) Rainflow Method
      ii) Cycle counting Method. (08 Marks)

OR

8 a. Explain various parameters to be considered to understand the effects of Notches. (08 Marks)

   b. Write short notes on Neuber's Rule and crack growth at Notches. (08 Marks)

Module-5

9 a. Explain :
      i)   Adhesive wear
      ii) Abrasive wear
      iii) Corrosion wear
      iv) Fretting wear. (08 Marks)

   b. Derive the expression for contact pressure distribution in spherical contact. (08 Marks)

OR

10 a. Explain the precautions to be considered while designing to avoid surface failures. (08 Marks)

   b. Write short notes on Dynamic contact stresses and surface fatigue failure modes. (08 Marks)

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