

# CBCS SCHEME

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18MDE22

## Second Semester M.Tech. Degree Examination, June/July 2019 Advanced Machine Design

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. List the modes of mechanical failure. (05 Marks)  
b. Explain Tresca theory with figure. (05 Marks)  
c. Explain:  
i) Coulumb Mohr theory  
ii) Modified Mohr theory of failure for designing with uneven brittle materials. (10 Marks)

OR

- 2 a. Explain the following with examples: (i) Safe life design (ii) Fail safe design (10 Marks)  
b. Explain the typical stages of the fatigue damage process. (05 Marks)  
c. Explain strategies in fatigue design with fatigue design flow chart. (05 Marks)

### Module-2

- 3 a. Explain the effect of surface Finish and Size effect on S-N Behavior. (10 Marks)  
b. An unnotched circular rod with a diameter of 10 mm is subjected to constant amplitude bending at room temperature, with  $S_m = 200$  MPa. The material is 4340 quenched and tempered alloy steel with  $S_U = 1240$  MPa,  $S_V = 1170$  MPa and  $S'_V = 1000$  MPa. If the rod is commercially polished, estimate the values of  $S_a$ ,  $S_{max}$ ,  $S_{min}$  and R for a median fatigue life of 50000 cycles and no yielding. (10 Marks)

OR

- 4 a. With neat sketch explain Ramberg-Osgood relationship. (06 Marks)  
b. Explain mean stress effect on  $\epsilon$ -N behavior. (06 Marks)  
c. Explain Bauschinger effect with neat sketch. (08 Marks)

### Module-3

- 5 a. Schematically explain Dugdale plastic zone strip model. (10 Marks)  
b. Explain:  
i) Loading modes  
ii) Stress intensity factor (10 Marks)

OR

- 6 a. Explain in detail the effect of stress level and mean stress on notch factor. (10 Marks)  
b. Sketch and explain Heigh diagram and modified Goodman's diagram for a notched part. (10 Marks)

### Module-4

- 7 a. Explain the purpose of cycle counting method and Rain flow method. (10 Marks)  
b. With neat sketch explain level-crossing method. (10 Marks)

OR

- 8 a. Discuss the applications of fracture mechanics to crack growth at notches. (10 Marks)  
b. Explain Glinka's Rule. (10 Marks)

Module-5

- 9 Write short notes on:  
i) Adhesive wear  
ii) Corrosion wear  
iii) Abrasive wear  
iv) Friction  
v) Mating surface (20 Marks)

OR

- 10 a. Briefly explain different surface fatigue failure modes. (10 Marks)  
b. Derive an expression for the pressure distribution in cylindrical contact and show the pressure distribution schematically. (10 Marks)

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