Bachelor of Mechanical Engineering 4th year 1st Semester Examination, 2024

Subject - Elements of Fracture Mechanics (Hons)

Full marks 100 **time 3 hrs**

Answer any five questions -

1. a. What do you mean by theoretical cohesive strength?
b. For steel, frature stress is in the order of E/1000, how can you prove it?
c. What is Griffith criteria? What are it's limitations?
d. What is Orwan's correction?
e. Explain what is meant by critical strain energy release rate? (5+7+4+2+2)

2. a. How can you deduce the concept of stress intensity factor from Westergards equations?
b. Explain one method of finding out critical stress intensity factor.
c. What is meant by plain strain fracture toughness?
d. Write down the expressions corelating critical stress intensity factor and critical strain energy release rates.
e. What is etch pit experiment to find out crack tip plasticity? (5+5+4+4+2)

3. a. What do you mean by R curve behavior?
b. Explain crack arrest.
c. Explain three intrinsic toughnening mechanisns.
d. What is the role of Ni and Mn in imparting fracture toughness to steel? (5+5+6+4)

4. a. Explain the stages of MVC.
b. What is meant by mirror mist hackle zone? How can we use it for finding out critical stress intensity factor?
c. What do you mean by crazing in polymer?
d. What is zenner cottrel model?
e. What is meant by long crack toughness?
f. What is the effects of grain shape on toughness? (5+5+3+2+2+3)

5. a. What is DBTT? How does it vary with strain rate ?
How does it change with thickness of specimen and why ?
b. What do you mean by J integral?
c. Describe the processes of crack generation.
d. Briefly highlight the crack propagation methods.
e. How can we use the Paris equation to find out the life of a rotating body?
f. What is the effect of grain size on creep? Explain. (5+3+3+3+3+3)

6. Write short notes on any five (4x5)

a. Transformation toughnening
b. Persistent slip band
c. Dynamic stress intensity factor
d. Indentation strength technique to measure toughness
e. Grain boundary microcracking
f. Stress corrosion cracking
g. Crack branching