CBCS SCHEME

16/17CAE421

Fourth Semester M.Tech. Degree Examination, Dec.2019/Jan.2020
Fracture Mechanics

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a.   Explain briefly the historical development of fracture mechanics.   **(06 Marks)**
    b.   Derive an expression for the fracture strength of a brittle material solid containing an elliptical crack using Griffith energy balance approach.   **(10 Marks)**

OR

2   a.   Explain the three basic models of fracture.   **(06 Marks)**
    b.   Write the singular stress field equations in the vicinity of a crack tip, assuming mode I and plane stress state.   **(06 Marks)**
    c.   What is Airy's stress function? Discuss.   **(04 Marks)**

Module-2

3   a.   Explain Irwin's plastic zone correction.   **(06 Marks)**
    b.   Derive the equation for plastic zone shape in the plane stress case.   **(10 Marks)**

OR

4   a.   Explain the effect of thickness on fracture toughness.   **(06 Marks)**
    b.   Describe the test procedure for determining stress intensity factor using CT specimen.   **(10 Marks)**

Module-3

5   a.   Derive an expression for the energy release rate for a DCB specimen.   **(10 Marks)**
    b.   Explain the concept of R curves.   **(06 Marks)**

OR

6   a.   Define CTOD and explain a method of finding CTOD in laboratory with sketches. **(10 Marks)**
    b.   What is J-integral? Show that J-integral is path independent.   **(06 Marks)**

Module-4

7   a.   What is cradle arrest? How it is achieved?   **(08 Marks)**
    b.   Explain crack branching.   **(08 Marks)**

OR

8   a.   Estimate the relationship between kinetic energy and crack speed.   **(08 Marks)**
    b.   Explain dynamic fracture toughness.   **(08 Marks)**

Module-5

9   a.   Establish the fatigue crack growth equation.   **(08 Marks)**
    b.   Explain the factors affecting crack propagation.   **(08 Marks)**

OR

10 a.   Explain variable amplitude service loading.   **(08 Marks)**
    b.   Explain fail safe and safe life.   **(08 Marks)**

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