Code: 9D15104

M.Tech I Semester Regular & Supplementary Examinations January/February 2017

FRACTURE, FATIGUE & CREEP DEFORMATION

(Machine Design)

Time: 3 hours Max. Marks: 60

Answer any FIVE questions

All questions carry equal marks

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1 (a) What are the characteristics of ductile and brittle fracture surfaces? Explain schematically different failure modes.
(b) Write a note on transition temperature during fracture for notched and un-notched specimen.

2 Derive an expression for fracture strength of a solid brittle material, containing an elliptical crack using Griffith's energy balance approach.

3 (a) What is the difference between stress intensity factor and critical stress intensity factors?
(b) Write a note on loading modes and state of stress ahead of crack tip.

4 (a) The plastic zone size obtained through Irwin's model is quite large in comparison to the plastic zone obtained through yield criterion applied to the elastic field. Why?
(b) Derive the plastic zone size as per Dugdale approach.

5 (a) Define J-integral and show that J-integral is path independent.
(b) Explain R-curve concept.

6 (a) Sketch and explain the cumulative damage theory to explain fatigue failure.
(b) Explain stage I, stage II and stage III of fatigue crack growth.

7 Explain the following:
(a) High cycle fatigue.
(b) Fatigue crack closure theories.
(c) Factors affecting the fatigue likes of welded joints.
(d) MINER's law.

8 Discuss in detail the following:
(a) Creep resistant materials.
(b) Ashby creep deformation maps.

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