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## 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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