# BACHELOR OF MECHANICAL (MECHANICAL ENGINEERING) 4th YEAR 1st SEMESTER EXAM-2019

## DESIGN METHODOLOGY FOR FRACTURE FATIGUE AND CREEP

Time:3hrs (Answer any ten from the following) Full marks: 100

Each question carries 10 marks

1. What are the main factors that influence the level of performance of a part or component? What are the causes of failure of engineering components?
2. List down the differences between ductile and brittle fracture. Explain the ductile-to-brittle phenomenon. Support your answer with suitable diagram.
3. Explain about Crack initiation and crack propagation rate. Comparison of slip bands formed under static loading and cyclic loading.
4. What is Strip-Yield model? Derive an expression for Keff under this approach.
5. Explain what is meant by fracture toughness. Explain the terms stress intensity factor K, critical stress intensity factor Kc and strain energy release rate.
6. Draw the schematic diagram of fatigue fracture surface. What is Basquin equation? Draw the typical S-N curves for ferrous and non-ferrous metals in the high-cycle region.
7. What is plane strain fracture toughness $KI_C$? How it is determined? And also draw the different modes of Crack deformation.
8. Explain about Griffith theory. Modified the Griffith equation to make it more compatible by including plastic energy.
9. What are the main features of brittle material fracture surface? Discuss the ductile-to-brittle transition temperature (DBTT) with the help of diagram.
10. Explain about basic factors contribute to a brittle-cleavage type of fracture. What causes a notch increases the tendency for brittle fracture.
11. Determine the influence of stress and temperature effect on creep behavior. Explain about the different creep deformation mechanisms.
12. Explain Irwin approach for crack tip plasticity with suitable diagram.
13. What is Paris-Ergodan law? Explain its significance.
14. Explain the fatigue limit and fatigue life for safe-life fatigue of the engineering materials. Support your answer with diagrams.