UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2018

Program/course: M. Tech. / RE   **Semester - II**
Subject: Fatigue, Fracture and Stress Analysis of Machine Components   **Max. Marks: 100**
Code   : MERE7005   **Duration: 3 Hrs.**
No. of page/s: 01

Note: All questions are compulsory.

Q.1 Explain J-integrals in details. [10 Marks]   (CO1)

Q.2 Explain three basic modes of fracture with appropriate diagrams. [10 Marks] (CO1)

Q.3 (A) Describe three basic factors responsible for fatigue failure. [5 Marks] (CO1)

(B) What are the names of the three macroscopic theories of crack extension? [5 Marks] (CO3)

Q.4 The records of a fracture test are as given below,

Crack Length a (mm)	Load (kN)	Load Point Displacement (mm)
29.5	120	0.4000
30.5	120	0.4050

Given: The fracture load P_c= 175 kN for crack length a = 30 mm, B= 32 mm, E=85 GPa and ν =0.3.

Calculate G_{IC} and K_{IC}. [10 Marks] (CO3)

Q.5 Explain the stress distribution in the vicinity of an elliptical crack of length 2a in an infinite plate for mode-I failure with appropriate equations. [10 Marks] (CO2)

Q.6 Explain maximum tangential stress criterion for crack extension with appropriate equations. [10 Marks] (CO3)

Q.7 Explain life estimation using Paris Law for fatigue crack growth. [10 Marks] (CO3)

Q.8 Explain stress intensity factors for all the three modes of failure with appropriate equations. [10 Marks] (CO2)

Q.9 Explain micro-mechanisms for fatigue fracture. [10 Marks] (CO4)

Q.10 Explain ultrasonic testing and radiographic imaging techniques for crack detection. [10 Marks] (CO4)