Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, July 2020

Programme Name: M.Tech/RE **Semester : II**
Course Name : Fatigue, Fracture and Stress Analysis of Machine Component
Course Code : MERE 7005 **Max. Marks: 100**
Nos. of page(s) : 01

Instructions: Submit the assignment within 24 hrs after receiving it.

Q.1 Describe three basic modes of fracture with related diagrams. [10 marks]

Q.2 Describe stress intensity factors for all the three modes of fracture. [10 marks]

Q.3 Derive the expression,

$$G = \frac{P^2}{2B}\frac{dC}{da}$$

For a double cantilever beam under a constant load P. [10 marks]

Q.4 With the help of relevant diagrams, explain stable and unstable crack growth. [10 marks]

Q.5 A DCB is loaded in a tensile testing machine. Determine critical energy release rate for it. Thickness of the specimen is 40 mm, depth of each cantilever beam is 22 mm and crack length is 55 mm. Modulus of elasticity is 200 GPa and crack propagates for a load of 15 kN. [15 marks]

Q.6 Describe the stress field at the crack tip of a central crack in an infinite plate loaded in mode II for plane strain. [15 marks]

Q.7 Describe the relationship between G_I and K_I in plane stress and plane strain conditions. If E= 220 GPa, ν=0.29 and K_I= 65 MPa$\sqrt{m}$ then calculate G_I for plane stress as well as plane strain conditions. [15 marks]

Q.8 A plate has double edge cracks. A uniform tension of 110 MPa is applied. If a= 25 mm, W= 85 mm and$f(\alpha) = 1.12 - 0.20\alpha - 1.20\alpha^2 + 1.93\alpha^3$ then calculate K_I. [15 marks]