



ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Mid-Semester Examination

Winter Semester, A.Y. 2022-2023

Course No. ME 4325

Time : 1½ hours

Course Title: Material Engineering

Full Marks : 75

There are 3 (Three) Questions. Answer all the questions. Marks in the margin indicate the full marks.

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- 1 a) A material can have high elasticity with either high or low strength. From the stress-strain curves for such materials choose one with brief reasoning which will be used for a structural application like in the base plate sheets of a steel bridge. Again, different methods are used to measure the stiffness of different metals and alloys. List the methods used to estimate stiffness from the stress-strain curves where the yield point may or may not be sharp. 12.5 (CO1, PO1, PO2)
- b) Some metals often fail due to ductile to brittle transition temperature. With necessary sketches describe why this happens and how this can be prevented in the design stage. Explain how operating temperature controls the mode of fracture. 12.5 (CO2, PO2, PO3)
- 2 Sketch the unit cells of each type of simple cubic crystal structure. The ductility of the metals is directly related to the atomic density of these metals. Calculate the necessary parameters to find out which one structure will exhibit the maximum ductility showing the relation with such parameter with the deformation behavior. 25 (CO1, CO2, PO1, PO2, PO3)
- 3 a) Distinguish between two different types of impact test. Using neat sketches, explain how the differential features can affect the measured mechanical properties. Consider the orientation of the sample to be tested and the state of stress applied on it. 12.5 (CO1, PO1, PO2)
- b) Differentiate between the failure modes due to time and fatigue effect. Discuss the fracture surface features to identify the mode of fracture. Explain how a dynamic loading system leads to failure at a much lower strength than the yield strength of a material. 12.5 (CO1, PO1, PO2)