

MT201- Structure and properties of materials

Date- 25 Nov 2011

Academic Year: 2011- 12

Time: 8:00 to 11:00 AM

Marks: 50

Instructions:

1. All Questions are compulsory
2. Draw neat figures wherever required
3. Figures to the right indicate full marks

- Q1** (A) State different type of strengthening mechanisms. Explain strengthening mechanism by strain hardening. 4
- (B) Draw diagrams for twin and tilt boundaries. 4
- (C) Why external surfaces and atomic vibrations are supposed to be defects. 2
- Q2** (A) Draw engineering and true stress strain diagrams. Define Proportional limit, resilience and toughness. 5
- (B) What is necking in tensile test? During necking, why engineering stress decreases whereas true stress increases. 2
- (C) A force of 20,000 N will cause a 1 cm x 1 cm bar of magnesium to stretch from 10 cm (gauge length) to 10.045 cm. Calculate young's modulus of magnesium. 3
- Q3** (A) What do you understand by property hardness? What are the ways to measure hardness other than indentation methods? 3
- (B) Explain the Vickers hardness test method along with its advantages and limitations. 3
- (C) What do you understand by ductile brittle transition temperature? How it is found out for metals. 4
- Q4** (A) What is importance of length /diameter (L/D) ratio in compression test? State deformation modes in compression test. 3
- (B) Differentiate between ductile and brittle fracture. 3
- (C) Draw schematic diagrams for nature of fracture surfaces in a) After tensile test, b) Fatigue failure (ductile /brittle region). 4
- Q5** (A) What is modulus of rupture (MOR)? How it is calculated. 3
- (B) Explain phenomenon of wear and its types. 3
- (C) Differentiate fowling pairs on the basis of principle of working, construction (and/or procedure) along with advantages and limitations. (Any one) 4
- a) Magnetic Particle test and Dye Penetrant test
- b) Ultrasonic test and Eddy current test

2. Jai Krishna and A.R. Cahndrasekaran, "Elements of Earthquake Engineering".
3. Arya, Shamsheer Prakash, Srivastava L.S., Brijesh Chandra, "Earthquake Engineering
4. Kamleshkumar- "Basic Geotechnical Earthquake Engineering" New Edge Publication
5. Steven Kramer- "Geotechnical Earthquake Engineering", ISBN Publication, Low price edition.
6. Relevant codes

CE-5305 (3:0:0) (03 Credits)

Soil Engineering II

Critical state soil mechanics: Critical State Line, Hvorslev Surface, Yield Surfaces: Modified Cam-clay and Original Cam-clay ; Elastic and plastic analysis of soil:- Constitutive relationships of soil; failure theories. Limit analysis-Upper bound theorems, lower bound theorems, limit equilibrium methods ; Soil Stabilization: Classification of stabilizing agents and stabilization processes. Nature and surface characteristics of soil particles. Concepts of surface area and contact points. Inorganic stabilizing agents. Strength improvement characteristic of soft and sensitive clay, Marine clay and waste material.

Reference Books:

1. Advanced soil mechanics- Braja M.Das, Tata Mc.- Grawhill
2. Principles of Soil Mechanics, R F Scott, Addison & Wesley
3. Fundamentals of Soil Behaviour, Mitchell, James K, John Wiley and Sons
4. Elasticity and Geomechanics, R.O. Davis and A.P.S. Selvadurai, Cambridge University Press, New York.

Soil Behaviour and Critical State Soil Mechanics, D.M. Wood, University of Glasgow

CE-5306 (3:0:0) (03 Credits)

Analysis and Design of Foundations

Geotechnical Exploration–Penetration Tests, plate load test, field vane shear, large box shear, pressure meter test, foundation instrumentation – settlement and displacement gauges. Shallow Foundation: Bearing capacity & settlement analysis, Design for shallow Foundation under vertical, horizontal and moment loading in sandy and in clayey soil. Pile Foundation – pile capacity and settlement analysis for individual and group piles under vertical, horizontal and moment loading in sandy and in clayey soil, pile load test, Foundation under Uplift Loads, negative skin friction, Foundations on rocky strata.

Note – Actual foundation design problems will be covered during tutorial classes.

Reference Books:

1. Foundation Engineering Hand book, Winterkorn & Fang
1. Analysis & Design of Pile Foundation, Polous & Davis