



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

CIVIL ENGINEERING

TUTORIAL QUESTION BANK

Course Title	MATERIALS, TESTING AND EVALUATION				
Course Code	ACEB08				
Programme	B.Tech				
Semester	IV	CE			
Course Type	Core				
Regulation	IARE - R18				
Course Structure	Theory			Practical	
	Lectures	Tutorials	Credits	Laboratory	Credits
	3	1	4	-	-
Chief Coordinator	Mr. K. Anand Goud, Assistant Professor.				
Course Faculty	Mr. K. Anand Goud, Assistant Professor. Mr. A. Jagadish Babu, Assistant Professor.				

COURSE OBJECTIVES:

The course should enable the students to:	
I	Make measurements of behaviour of various materials used in Civil Engineering.
II	Provide physical observations to complement concepts learnt.
III	Introduce experimental procedures and common measurement instruments, equipment, devices.
IV	Disclose the variety of established material testing procedures and techniques.

COURSE OUTCOMES (COs):

CO 1	Identify the different engineering materials, properties, manufacturing process of materials.
CO 2	Describe the mechanical behaviour and characteristics, elastic and plastic deformation of metals, strength properties and background of fracture mechanics.
CO 3	Conduct mechanical testing of various metals like iron, steel and various non-ferrous metals, impact testing, background of fracture toughness of different materials, creep, fatigue.
CO 4	Understand the standard testing procedure of bricks, sand, concrete, soils, bitumen and bitumen mixes.
CO 5	Describe the properties, mechanical behaviour of polymers, metals, composites, cementitious materials and special materials.

COURSE LEARNING OUTCOMES (CLOs):

ACEB08.01	Identify the properties of engineering materials like cement, sand, concrete, ceramics, bitumen, structural steel etc.
ACEB08.02	Explain the classification of engineering materials and uses of materials.
ACEB08.03	Understand the manufacturing process of cement, concrete, bitumen, glass, plastics, metals, paints and other engineering materials.
ACEB08.04	Classify the steel, glass, varnishes, adhesives, carbon composites.
ACEB08.05	Explain the mechanical behaviour and characteristics of different metals.
ACEB08.06	Understand the importance of elasticity principle, characteristics and plastic deformation of metals.
ACEB08.07	Explain standards for different materials, stress-strain interpretation.
ACEB08.08	Describe the fundamentals of internal friction, creep, brittle fracture of steel.
ACEB08.09	Understand the concept of fatigue of materials, structural integrity assessment procedure.
ACEB08.10	Perform the mechanical testing of various metals like iron, steel and non-ferrous metals.
ACEB08.11	Explain elastic deformation and plastic deformation of metals.
ACEB08.12	Understand the impact testing, fatigue and creep of materials.
ACEB08.13	Explain fracture toughness of different materials like steel and non-ferrous metals.
ACEB08.14	Explain the testing procedures of bricks and sand.
ACEB08.15	Describe the testing procedures of fresh and hardened concrete.
ACEB08.16	Understand the properties of soil by conducting the different tests.
ACEB08.17	Explicate the procedures of testing bitumen and bitumen mixes.
ACEB08.18	Understand the testing procedures of polymers and polymer based materials.
ACEB08.19	Explain the behaviour of metals under various loads.
ACEB08.20	Describe the mechanical behaviour of composite materials.
ACEB08.21	Discuss the properties of cementitious materials like fly ash, blast furnace slag.

TUTORIAL QUESTION BANK

MODULE- I				
INTRODUCTION TO ENGINEERING MATERIALS				
Part - A (Short Answer Questions)				
S No	QUESTIONS	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes (CLOs)
1	List out the ingredients of cement.	Remember	CO 1	ACEB08.01
2	List out the various grades of cement in India.	Remember	CO 1	ACEB08.01
3	What do you mean by setting time of cement?	Understand	CO 1	ACEB08.01
4	Define Seasoning of timber.	Remember	CO 1	ACEB08.01
5	What are the important qualities of timber?	Remember	CO 1	ACEB08.02
6	What are the properties of glass?	Remember	CO 1	ACEB08.02
7	Define ferrous metals. What are the different categories of ferrous metals?	Remember	CO 1	ACEB08.03
8	What are the different types of glass?	Remember	CO 1	ACEB08.03
9	What role does aluminium play in building construction?	Understand	CO 1	ACEB08.03
10	Mention different types of steels.	Understand	CO 1	ACEB08.03
11	What is the advantage of light weight concrete?	Remember	CO 1	ACEB08.01
12	What is fiber reinforced concrete? Give examples.	Remember	CO 1	ACEB08.01
13	List out the different types of varnishes.	Remember	CO 1	ACEB08.04
14	Define adhesive materials which are used in the construction.	Understand	CO 1	ACEB08.04
15	What are the uses of paints and varnishes?	Remember	CO 1	ACEB08.02
16	Mention the properties of rubber and asbestos.	Remember	CO 1	ACEB08.04
17	Define composite material.	Remember	CO 1	ACEB08.04
18	What is polymer concrete?	Remember	CO 1	ACEB08.04
19	What is high performance of concrete?	Understand	CO 1	ACEB08.01
20	Mention different types of metals used in the construction.	Understand	CO 1	ACEB08.03
Part - B (Long Answer Questions)				
1	What are the ingredients of Portland cement? State the function and limits of each of them.	Remember	CO 1	ACEB08.01
2	Explain the various types of cement. Mention their applications.	Remember	CO 1	ACEB08.01
3	Explain the following a) Rapid hardening cement b) High alumina cement	Understand	CO 1	ACEB08.01
4	Describe the setting and hardening of cement.	Understand	CO 1	ACEB08.01
5	What are the initial and final setting times of cement? What is their importance?	Remember	CO 1	ACEB08.02
6	What is bulking of sand? How does it affect concrete mix?	Understand	CO 1	ACEB08.02
7	Explain the grading of sand.	Understand	CO 1	ACEB08.02
8	Write short notes on a. Light weight concrete b. Fibre reinforced concrete	Understand	CO 1	ACEB08.02
9	Give the uses and applications of following concretes i. High strength concrete ii. Reinforced cement concrete	Understand	CO 1	ACEB08.03
10	Write about different types of polymer concretes and their applications.	Remember	CO 1	ACEB08.03
11	What are refractories and their types? Give examples of each of them.	Remember	CO 1	ACEB08.03
12	What are the ceramic materials? Explain about the properties of ceramic materials.	Remember	CO 1	ACEB08.03
13	Describe the manufacturing process of glass.	Remember	CO 1	ACEB08.03
14	What are the constituents of glass? Give the functions of each of them.	Remember	CO 1	ACEB08.03
15	Describe briefly the following materials. i. Asbestos ii. Geosynthetics	Understand	CO 1	ACEB08.03

16	Write about the properties and important uses of following materials i. Cast iron ii. Wrought iron iii. Steel	Understand	CO 1	ACEB08.04
17	What are the various ingredients of paints? State the functions of each of them.	Remember	CO 1	ACEB08.04
18	Classify different types of varnish and briefly describe them.	Remember	CO 1	ACEB08.04
19	Describe briefly the classification of bitumen.	Remember	CO 1	ACEB08.04
20	Briefly describe the properties of following building materials. a. Adhesives b. Asbestos	Understand	CO 1	ACEB08.04

MODULE-II

INTRODUCTION TO MATERIAL TESTING

Part – A (Short Answer Questions)

1	Distinguish between the terms Elasticity and Plasticity with examples.	Understand	CO 2	ACEB08.05
2	Define the following properties of engineering materials a. Toughness b. Hardness c. Strength.	Understand	CO 2	ACEB08.05
3	Define Stress at a point in a material, and mention its units.	Understand	CO 2	ACEB08.05
4	Define strain and mention its units.	Understand	CO 2	ACEB08.05
5	Draw stress-strain diagram for mild steel indicating all critical points	Understand	CO 2	ACEB08.05
6	What is hardness?	Understand	CO 2	ACEB08.06
7	Define toughness of materials.	Understand	CO 2	ACEB08.06
8	What do you mean by deformation?	Understand	CO 2	ACEB08.06
9	What is internal friction?	Understand	CO 2	ACEB08.06
10	Define following terms i. Creep ii. fatigue	Understand	CO 2	ACEB08.07
11	What is the difference between failure and fracture?	Understand	CO 2	ACEB08.07
12	Define brittleness of material.	Remember	CO 2	ACEB08.07
13	Define fracture mechanics.	Understand	CO 2	ACEB08.07
14	What are mechanical characteristics of metals?	Remember	CO 2	ACEB08.08
15	What do you mean by shear stress	Remember	CO 2	ACEB08.08
16	Define elastic deformation.	Understand	CO 2	ACEB08.08
17	Describe plastic deformation.	Understand	CO 2	ACEB08.08
18	Define Hook's law.	Understand	CO 2	ACEB08.09
19	Mention different types of stresses.	Remember	CO 2	ACEB08.09
20	Define elastic limit.	Remember	CO 2	ACEB08.09

Part - B (Long Answer Questions)

1	Write a short note on a. Elasticity b. Elastic limit c. Plasticity	Understand	CO 2	ACEB08.05
2	Distinguish between following a. Stress and strain b. Tensile stress and compressive stress	Understand	CO 2	ACEB08.05
3	With the help of stress-strain diagram, explain strain hardening.	Understand	CO 2	ACEB08.05
4	Explain different types of stresses and strains.	Understand	CO 2	ACEB08.06
5	i. Define the terms ii. Elasticity iii. Elastic limit iv. Young's modulus v. Modulus of rigidity	Remember	CO 2	ACEB08.06
6	Distinguish between the following with explanation a. Stress and strain b. Force and stress c. Tensile stress and compressive stress	Understand	CO 2	ACEB08.06

7	Explain following a. Strain hardening b. Ultimate strength c. Toughness	Understand	CO 2	ACEB08.07
8	Describe the hardness test of mild steel.	Remember	CO 2	ACEB08.07
9	Illustrate the impact testing of mild steel.	Understand	CO 2	ACEB08.07
10	Write in detail the tensile test procedure of mild steel.	Understand	CO 2	ACEB08.07
11	What is fracture mechanics? Explain different types of fracture mechanics.	Remember	CO 2	ACEB08.08
12	Explain different types of fracture mode shapes.	Remember	CO 2	ACEB08.08
13	What are the three modes of loading in fracture mechanics? Explain with neat sketch.	Understand	CO 2	ACEB08.08
14	Write a short note on fatigue failure.	Remember	CO 2	ACEB08.08
15	What is meant by stress concentration? Explain.	Remember	CO 2	ACEB08.08
16	Explain the methods of reducing stress concentrations.	Remember	CO 2	ACEB08.09
17	Explain fooling terms. a. Brittle fracture. b. Ductile fracture.	Understand	CO 2	ACEB08.09
18	Explain fracture toughness.	Remember	CO 2	ACEB08.09
19	Illustrate important mechanical properties that influence the selection of materials.	Understand	CO 2	ACEB08.09
20	Explain with neat sketch, stress strain diagram of mild steel indicating its salient points.	Remember	CO 2	ACEB08.09

MODULE -III

STANDARD TESTING & EVALUATION PROCEDURES

Part - A (Short Answer Questions)

1	State the difference between cast iron and wrought iron.	Remember	CO 3	ACEB08.10
2	Specify important uses of cast iron.	Understand	CO 3	ACEB08.10
3	What are the uses of wrought iron?	Understand	CO 3	ACEB08.10
4	Describe the properties of mild steel.	Remember	CO 3	ACEB08.10
5	What is the composition of mild steel.	Remember	CO 3	ACEB08.10
6	What are the important properties of high carbon steel?	Remember	CO 3	ACEB08.11
7	State the carbon contents and uses of the following metals: (a) Pig iron (b) Cast iron (c) Wrought iron (d) Low-carbon steel	Remember	CO 3	ACEB08.11
8	What are the properties of aluminum?	Understand	CO 3	ACEB08.11
9	Write the uses of aluminium.	Remember	CO 3	ACEB08.11
10	What are the different types of steels?	Remember	CO 3	ACEB08.11

11	Describe the properties and uses of high tensile steel.	Remember	CO 3	ACEB08.12
12	Define creep.	Remember	CO 3	ACEB08.12
13	What is fatigue?	Understand	CO 3	ACEB08.12
14	What do you mean by creep deformation?	Remember	CO 3	ACEB08.12
15	What are the modes of fracture?	Understand	CO 3	ACEB08.13
16	What is fracture mechanics?	Understand	CO 3	ACEB08.12
17	Mention different types of non-ferrous materials.	Understand	CO 3	ACEB08.12
18	Define fooling terms i. deformation ii. displacement	Understand	CO 3	ACEB08.12
19	What are the causes of creep?	Remember	CO 3	ACEB08.13
20	Define impact loading.	Remember	CO 3	ACEB08.13

Part - B (Long Answer Questions)

1	Define metal. Explain different types of metals briefly.	Understand	CO 3	ACEB08.10
2	State cast iron and wrought iron . Write a short note on cast iron and wrought iron.	Understand	CO 3	ACEB08.10
3	What are the properties and uses of cast iron?	Remember	CO 3	ACEB08.10
4	List out the properties of cast iron and wrought iron.	Understand	CO 3	ACEB08.10
5	Define ferrous metals and non-ferrous metals with examples? Explain about ferrous metals.	Understand	CO 3	ACEB08.10
6	What are the properties and uses of wrought iron?	Remember	CO 3	ACEB08.11

7	Mention different types of steels with their composition. Write their properties.	Remember	CO 3	ACEB08.11
8	What do you mean by non-ferrous metal? Explain manufacturing process of aluminium.	Understand	CO 3	ACEB08.11
9	What are the important properties of aluminum? Discuss in detail the uses of aluminium.	Understand	CO 3	ACEB08.11
11	Explain mode loading that a crack can experience.	Remember	CO 3	ACEB08.12
12	Why is fracture toughness important? Explain.	Understand	CO 3	ACEB08.12
13	Why is impact testing necessary?	Understand	CO 3	ACEB08.12
14	What is ductile brittle transition temperature?	Understand	CO 3	ACEB08.12
15	Describe briefly the fracture toughness of different materials.	Remember	CO 3	ACEB08.13
16	What are the characteristics of friction?	Remember	CO 3	ACEB08.13
17	What are the types of impact tests?	Understand	CO 3	ACEB08.13
18	What are the various factors influencing fatigue behaviour?	Understand	CO 3	ACEB08.13
19	Describe the fatigue testing of material.	Understand	CO 3	ACEB08.13

MODULE -IV

STANDARD TESTING PROCEDURES

Part – A (Short Answer Questions)

1	What are the tests performed to check the quality of bricks.	Remember	CO 4	ACEB08.14
2	Define the term compaction.	Understand	CO 4	ACEB08.14
3	What is the use bulk density test of fine aggregate?	Understand	CO 4	ACEB08.14
4	Define Water/cement ratio	Remember	CO 4	ACEB08.14
5	What is the purpose of conducting Non-destructive tests?	Remember	CO 4	ACEB08.14
6	What are the ingredients of concrete?	Remember	CO 4	ACEB08.14
7	Mention different workability tests of fresh concrete?	Understand	CO 4	ACEB08.15
8	Mention different grades of concrete.	Remember	CO 4	ACEB08.15
9	Define Non Destructive Testing?	Understand	CO 4	ACEB08.15
10	What do you mean by bulking?	Understand	CO 4	ACEB08.15
11	Define the term workability.	Remember	CO 4	ACEB08.15
12	What are the different types of bitumen?	Remember	CO 4	ACEB08.16
13	Write the general properties of bituminous materials.	Understand	CO 4	ACEB08.16
14	What is the significance of Ring and ball test	Understand	CO 4	ACEB08.16
15	Define water content and name the laboratory tests used for determining water content.	Understand	CO 4	ACEB08.16
16	Define liquid limit & plastic limit.	Remember	CO 4	ACEB08.16
17	Define Shrinkage limit.	Understand	CO 4	ACEB08.17
18	What is the classification of the soil based on particle sizes?	Remember	CO 4	ACEB08.17
19	What are the properties of hardened concrete?	Remember	CO 4	ACEB08.17
20	What is the difference between bitumen and asphalt?	Remember	CO 4	ACEB08.17
21	What are the different types of bricks?	Remember	CO 4	ACEB08.17

Part – B (Long Answer Questions)

1	Describe the tests performed to check the quality of bricks?	Remember	CO 4	ACEB08.14
2	Write a short note on a. water absorption test b. efflorescence test	Understand	CO 4	ACEB08.14
3	Explain about the test conducted to determine the bulk density of fine aggregate.	Understand	CO 4	ACEB08.14
4	Discuss about the following i. silt content test ii. fineness modulus	Remember	CO 4	ACEB08.14
5	Mention different types of tests performed to find workability of fresh concrete. Explain anyone of them.	Understand	CO 4	ACEB08.14
6	What is meant by workability of concrete? Explain about slump cone test.	Understand	CO 4	ACEB08.14
7	Describe compaction factor test.	Remember	CO 4	ACEB08.15
8	Describe briefly the following i. compression test ii. flexure test iii. split tensile strength test	Remember	CO 4	ACEB08.15

9	What is non-destructive testing? Explain about rebound hammer test.	Remember	CO 4	ACEB08.15
10	What is the need of Non-destructive testing? Mention its advantages.	Understand	CO 4	ACEB08.15
11	Discuss briefly about i. Moisture content test of soil ii. Specific gravity test of soil	Understand	CO 4	ACEB08.15
12	Discuss briefly about Atterberg limits test on soil.	Remember	CO 4	ACEB08.16
13	Explain the procedure to determine the dry density of soil by core cutter method	Understand	CO 4	ACEB08.16
14	Explain briefly about different tests performed to determine the properties of soil.	Understand	CO 4	ACEB08.16
15	Write about the following test of bitumen a. Ductility test b. Penetration test	Understand	CO 4	ACEB08.16
16	Explain the test procedure of flash and fire point test.	Remember	CO 4	ACEB08.16
17	Discuss briefly about the tests conducted on bitumen.	Remember	CO 4	ACEB08.17
18	Discuss the significance of following tests i. Ring and ball test ii. Ductility test iii. Viscosity test	Understand	CO 4	ACEB08.17
19	Explain briefly about the different workability tests of fresh concrete.	Remember	CO 4	ACEB08.17
20	Explain in detail the procedure for Sieve analysis.	Remember	CO 4	ACEB08.17

MODULE - V

TESTING PROCEDURES OF SPECIAL MATERIALS

Part - A (Short Answer Questions)

1	Classify polymers. Give the examples.	Remember	CO 5	ACEB08.18
2	Define composites. What are the uses of composite materials?	Remember	CO 5	ACEB08.18
3	Mention the advantages of composites.	Understand	CO 5	ACEB08.18
4	Classify composites with examples.	Understand	CO 5	ACEB08.18
5	What are the components of fly ash?	Understand	CO 5	ACEB08.19
6	Why fly ash is used in cement?	Understand	CO 5	ACEB08.19
7	Mention the uses of ground granulated blast furnace slag.	Remember	CO 5	ACEB08.19
8	What is meant by silica fume?	Understand	CO 5	ACEB08.19
9	Define mechanical properties of metal	Understand	CO 5	ACEB08.19
10	What is the difference between fly ash and GGBS?	Remember	CO 5	ACEB08.19
11	What are examples of polymers?	Understand	CO 5	ACEB08.20
12	Classify different types of polymers.	Understand	CO 5	ACEB08.20
13	What is the difference between Class C and Class F fly ash?	Understand	CO 5	ACEB08.20
14	What are the uses of polymers?	Remember	CO 5	ACEB08.20
15	What are the types of cementitious materials?	Remember	CO 5	ACEB08.20
16	Define cementitious material.	Remember	CO 5	ACEB08.21
17	What are the advantages of using supplementary cementitious materials?	Understand	CO 5	ACEB08.21
18	List out the advantages of using fly ash in concrete.	Remember	CO 5	ACEB08.21
19	What is the composition of ground granulated blast furnace slag.	Remember	CO 5	ACEB08.21

Part - B (Long Answer Questions)

1	Explain briefly about the different tests conducted on metals.	Understand	CO 5	ACEB08.18
2	Discuss briefly about the test conducted to determine the hardness of metal.	Understand	CO 5	ACEB08.18
3	Explain about the ductility testing of metal.	Understand	CO 5	ACEB08.18
4	Explain the test procedure of impact test of metal.	Understand	CO 5	ACEB08.18
5	What are the different types of cementitious materials? Explain briefly.	Remember	CO 5	ACEB08.19
6	What is fly ash? Explain about the chemical composition of fly ash?	Remember	CO 5	ACEB08.19
7	Briefly explain about the physical properties of fly ash.	Remember	CO 5	ACEB08.19
8	Discuss the classification of fly ash. Mention its uses.	Understand	CO 5	ACEB08.19
9	What are the constituents of blast furnace slag cement? Mention its uses.	Understand	CO 5	ACEB08.19
10	Give details of the properties of blast furnace slag cement. What are the advantages and disadvantages of blast furnace slag cement?	Remember	CO 5	ACEB08.19
11	What do you mean by composite material? Explain about the composition of composite materials.	Remember	CO 5	ACEB08.20
12	Discuss the uses and applications of composite materials. Give some examples for composite materials.	Remember	CO 5	ACEB08.20

13	What are the physical properties of fly ash? Explain briefly	Remember	CO 5	ACEB08.20
14	Define polymers. Classify them and give typical applications.	Remember	CO 5	ACEB08.20
15	Classify composites. Explain their properties.	Remember	CO 5	ACEB08.20
16	What is silica fume? Explain about the composition and properties of silica fume.	Remember	CO 5	ACEB08.21
17	Define composite material. Discuss about the properties of composites.	Remember	CO 5	ACEB08.21
18	What is the classification of composite materials?	Remember	CO 5	ACEB08.21
19	What are the applications of composite materials? Mention disadvantages of composite materials.	Remember	CO 5	ACEB08.21

Prepared by:

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