Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

	Course Title: **SOIL & MATERIAL TESTING LAB**		
	Credits (L:T:P) **0:2:4**	Total Contact Hours: **78**	Course Code: **15CE45P**
	Type of Course: **Practical's, Task work**	**Credit :03**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 50 Marks

Pre-requisite: Knowledge of strength of materials, Materials of construction.

Course objectives

1. To provide the basic knowledge of science and engineering with respect to properties of construction materials and to *identify* problems in choosing the suitable materials in any construction site.
2. Ability to apply knowledge of Mathematics and Engineering in calculating the mechanical properties like tensile strength, compressive strength etc.
3. Ability to *communicate* effectively about mechanical properties of materials, and apply the knowledge in design of concrete structures, soil subgrade and pavements.
4. Understands use of modern *instruments* and engage in life-long learning with the advances in material testing without inhibiting *professional and ethical responsibility*.

On successful completion of this course, the student will be able to

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Reproduce the basic knowledge of mathematics, science and engineering in assessing the quality and suitability of construction materials, structural element, & preparation of test reports as per the IS specification, by inculcating professional and ethical responsibility in the areas of material testing & modern instrument usage	R/U/Ap/ Ay/C	1,2,3,4,5 ,7,8,9	72
CO2	Formulate and solve in teams in order to improve future problem solving ability in material engineering and able to present it.	R/U/Ap/Ay	1,2,3,4,5 ,6,7,8,9, 10	6
			Total sessions	**78**

Legend- R; Remember U: Understand Ap: Application Ay: Analysis C:Creation E: Evaluation

Programme outcome Attainment Matrix

Course	Programme Outcome									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
	Basic knowledge	Discipline knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & Sustainability	Ethics	Individual and Team work	Communication	Life long learning
Soil & Material Testing Lab	3	3	3	3	3	3	3	3	3	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

DETAILED COURSE CONTENT

Tests on Cement as per IS code **9**

1. Determination of Fineness by Surface area (Blaine air Permeability apparatus / 90 micron sieve)
2. Determination of Specific gravity
3. Normal Consistency & Setting time
4. Test on Grade of Cement (Mortar Cube)

Tests on Aggregate as per IS code **9**

1. Specific gravity of Fine Aggregate and Coarse Aggregate
2. Water absorption test of Fine Aggregate and Coarse Aggregate
3. Grading analysis of Fine and Coarse Aggregates
4. Bulking of sand.
5. Bulk Density of Coarse Aggregate

Tests on cement concrete as per IS code **15**

1. Slump test
2. Compaction factor test
3. Compressive strength of Concrete cubes and Split Tensile test for cylinders.
4. Non destructive testing (Rebound hammer or Ultra sonic pulse velocity)

Tests on Road Materials as per MORTH Specifications **9**

1. Abrasion test on road aggregates by Los Angeles (Abrasion Testing Machine)
2. Impact test on road aggregates.

Tests on other Building Materials as per IS Code **6**

1. Water absorption test & Compression test on bricks or building blocks
2. Tensile test on steel

Tests on Soils as per IS code **18**

1. Grain Size analysis of soils
2. Atterberg limits a) Liquid limit b) Plastic limit c) Shrinkage limit

3. Tests on Moisture content of soil (Oven drying method)
4. Field Density of Soil By Core cutter
5. Standard Proctor Compaction Test on soil

*Test reports should be done for all experiments. Formats should be followed as per industries or IS codes, this should be integrated in the Graded exercise for each experiment.

Suggested activities

The topic should be related to the course in order to enhance his knowledge, practical skill & and lifelong learning, communication, modern tool usage.

1. Collect the information with proper justification for the fine aggregates used for different constructional activities such as foundation, plastering, concreting etc mentioning zonal classification.
2. Extraction of disturbed and undisturbed soil samples and finds field density.
3. Presentation on Strain gauges, strain indicators, extensometer.
4. Prepare and compare Soil classification chart as per IS and ASTM or 3 Phase system.
5. Writing and Collecting test report formats by consulting industry on various construction materials other than given experiments.
6. Collecting Specifications of various materials and correlate with standards.
7. Collecting and study of various IS codes regarding testing of materials.
8. Spread sheet of concrete mix design template
9. Collection of minimum compression strength values and water cement ratio of concrete used for different structural components from IS codes
10. Tests on grouting and its applications
11. Comparative study of M-sand with Natural sand
12. Tools and equipment with pictorial presentation chart
13. Finding unit weight of various diameters of HYSD and TMT steel and compare with theoretical calculations.
14. Model of plate load test.
15. Water absorption test on Fine and coarse aggregate.
16. Field tests on various building materials such as cement, sand, brick etc as per codes.
17. A study of local soils for rammed earth construction
18. Study of strenght and properties of eucalyptus as a truss material
19. Rammed earth wall
20. Role of geo synthetic in the improvement of strength of soil
21. Compressive strength characteristics of stacked stabilised soil cement blocks
22. Strength properties of bhalki soil
23. Stabilization of soft soils using industrial wastes
24. Study of strength parameters of silica fume concrete
25. Study on infiltration rate on different soils of your city/town/locality
26. Effect of ph on physical properties of fine-grained soils
27. A study of laterite particles in adsorption of oil and grease

NOTE

1. Students should select any one of the above or other topics relevant to the subject approved by the concerned faculty, individually or in a group of 3 to 5. Students should mandatorily

submit a written report and make a presentation on the topic. The task should not be repeated among students. Report will be evaluated by the faculty as per rubrics. Weightage for 5 marks Internal Assessment shall be as follows: (Unsatisfactory **1**, Developing **2**, Satisfactory **3**, Good **4**, Exemplary **5**)

2. Reports should be made available along with bluebooks to IA verification officer

Example of model of rubrics / criteria for assessing student activity

Dimension	Students score (Group of five students)				
	STUDENT 1	STUDENT 2	STUDENT 3	STUDENT 4	STUDENT 5
Rubric Scale	Unsatisfactory **1**, Developing **2**, Satisfactory **3**, Good **4**, Exemplary**5**				
1.Organisation	3				
2.Fulfill team's roles & duties	4				
3.Conclusion	5				
4.Convensions	2				
Total	14				
Average=(Total /4)	14/4=3.5=4				
Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks One activity on any one CO (course outcome) may be given to a group of FIVE students					

Note: Dimension should be chosen related to activity and evaluated by the course faculty.

Course Delivery: The course will be delivered through lectures and Power point presentations/ Video/ demonstration / Practices/ Site visits / Expert lectures.

Course Assessment and Evaluation Scheme

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment method	CIE	IA	Students	Twice test (Average of twice tests)	10	Blue books	CO1,CO2
				Record	10	Graded exercise	CO1,CO2
				Task work	05	Task work reports	CO1,CO2
	SEE	End Exam		End of the course	50	Answer scripts at BTE	CO1,CO2
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	CO1 Delivery of course
	End of Course Survey			End of the course		Questionnaires	CO1,CO2 Effectiveness of Delivery of instructions & Assessment Methods

***CIE** – Continuous Internal Evaluation ***SEE** – Semester End Examination

Note:

1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student task work activities.

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

Sl. No	Bloom's taxonomy	% in Weightage
1	Remembering and Understanding	**25**
2	Applying the knowledge acquired from the course	**40**
3	Analysis	**20**
4	Synthesis (Creating new knowledge)	**10**
5	Evaluation	**5**

TEXT BOOKS

1. Timoshenko and Young, Strength of Materials - Vol II, Von Nastrand Company, New York
2. Laboratory Manual prepared by the Department
3. Shetty M.S, 'Concrete Technology S. Chand & Co. Ltd, New Delhi.
4. Mehta P.K, 'Properties of Concrete Tata McGraw Hill Publications, New Delhi
5. Reference Books:
6. Neville AM, 'Properties of Concrete ELBS Publications, London.
7. Relevant BIS codes.

REFERENCES

1. Concrete Technology By MS Shetty (S. Chand Publication 16 Edition)
2. IS Codes
   a) IS 8112:1989 -43 Grade OPC Specification
   b) IS-4031-PART-2
   c) IS 12269:1987 -53 Grade OPC Specification
   d) IS 1489(PART -I) :1991- Portland Pozzolona Cement Specification
   e) IS 383:1970 – Specification for Coarse & fine Aggregate for Concrete
   f) IS 456 :2000 – Pain & RCC Code of Practice
   g) IS 1786:1985 – Specification for HYSD Steel bars & wires for RCC
   h) IS 2185 PART-I:1979–Specification for Concrete masonry units Hollow & Solid Concrete Blocks
   i) IS 1077 :1992 – Common Burnt Clay Building Bricks Specifications
   j) IS 2720 Part III – Determination of water contents of Soil
   k) IS 2720 Part IV – Grain size analysis of Soil
   l) IS 2720 Part V– Determination of Liquid limits & Plastic Limits of Soil
3. Material Testing Lab Manual – Gambir.
4. Soil Testing Manual – HD Charan & KS Grover.
5. MORTH (Ministry Of Road Transport and Highways) Specifications

E-links

1. http://site.iugaza.edu.ps/mymousa/files/Material_-Testing-lab-manual.pdf
2. http://www.technicalsymposium.com/CIVIL_SEM5_CE2307LM.pdf
3. http://docslide.us/documents/som-bmt-lab-manual-final.html

SCHEME OF EXAMINATION

Material & Soil Testing Laboratory		
1	Writing Procedure for a Question	10
2	Conduction of a Experiment	10
3	Tabulation/Calculation	10
4	Result / Conclusion	5
5	Viva	5
6	Task work	5
7	Record	5
	Total	**50**

LIST OF EQUIPEMENTS AND APPARATUS

Sl.No	Name of Equipments and Apparatus	No
1	Blaine's permeability Apparatus	6
2	Density/specific Gravity Bottle	6
3	Vicat Apparatus with Accessories	6
4	Mortar cube Moulds 50mm2 (7.06x7.06)	6
5	Pycnometer	6
6	Sieve10, 4.75, 2.36, 1.18mm, 600,300,150micron with lid & Pan(Concrete Fine agg.)	2 sets
7	Measuring Jars of 1000, 500, 100, 10ml	3
8	Mechanical sieve Shaker for the above set of sieves	1
9	Sieve 80, 40, 20, 4.75 mm with Lid & Pan(Coarse Agg.)	2sets
10	Measuring Cylinder(metal) 15 l, 250mm dia and 300mm height	3
11	Mechanical sieve Shaker for the above set of sieves	1
12	Slump Cone with accessories	3
13	Compaction factor testing machine	3
14	Concrete cube moulds150x150x150mm	6
15	Concrete cylindrical moulds150mm dia, 300mm height	3
16	Compression Testing Machine of 200 tonne capacity	1
17	Universal Testing Machine of 40 tonne capacity	1
18	Sieve 125, 90, 63, 45, 22.4, 13.2, 11.2 mm with Lid & Pan(Road aggregate)	2sets
19	Mechanical sieve Shaker for the above set of sieves	1
20	Los angels abrasion testing machine with charges	1
21	Impact testing machine with 12.5mm & 10mm Sieve with lid & pan	1

Sl.No	Name of Equipments and Apparatus	No
22	Digital weighing Balance 12 kg capacity with minimum 1 gm accuracy	3
23	Hot air Oven	1
24	Steel containers	10
25	Core cutter with dolly	3
26	Standard proctor compaction apparatus	2
27	Atterberg limits apparatus	2
28	Sieve100,63,40,20,,10,4.75,2 ,1 mm &600,425,212,150,75 micron with lid & pan (Soil test)	2
29	Rebound hammer	1
30	Ultra sonic pulse velocity kit	1
31	Strain gauage with stand	2
32	Strain indicator	1

Model Question bank (Viva voce aid)

OBJECTIVE QUESTIONS ON COMPACTION FACTOR TEST ON CONCRETE

Q.1. Compaction factor test is used to measure

(a) water cement ratio

(b) workability

(c) compressive strength

(d) tensile strength

Q.2. Compaction factor test is used for

(a) dry mixes where slump test generally fails

(b) wet mixes where slump test generally fails

(c) both dry and wet mixes

(d) none of these

Q.3. In compaction factor(C.F.) test, the two top and middle hoppers are

(a) cylindrical

(b) hexagonal

(c) rectangular

(d) conical

Q.4. In compaction factor test, the bottom container is

(a) conical

(b) rectangular

(c) hexagonal

(d) cylindrical

Q.5. In compaction factor test, if the weight of concrete in bottom cylinder(without compaction) is w and that of after filling a similar concrete and compaction, is W, then

(a) C.F. = W/w

(b) C.F. = w/W

(c) C.F. = loge(W/w)

(d) C.F. = loge(w/W)

Q.6. C.F. for concreting of small sections with vibration should be

(a) 0.75 to 0.80

(b) 0.80 to 0.85

(c) 0.85 to 0.92

(d) greater than 0.92

Q.7. C.F. for concreting of lightly reinforced sections with vibration should be

(a) 0.75 to 0.80

(b) 0.80 to 0.85

(c) 0.85 to 0.92

(d) greater than 0.92

Q.8. C.F. for concreting of lightly reinforced sections without vibration should be

(a) 0.75 to 0.80

(b) 0.80 to 0.85

(c) 0.85 to 0.92

(d) greater than 0.92

Q.9. C.F for concreting of heavily reinforced sections without vibration should be

(a) 0.75 to 0.80

(b) 0.80 to 0.85

(c) 0.85 to 0.92

(d) greater than 0.92

Q.10. Slump for concreting of lightly reinforced sections without vibration should be

(a) 10 to 15 mm

(b) 15 to 25 mm

(c) 25 to 75 mm

(d) 75 to 125 mm

1. Define hardness
2. Which hardness tests and scales would you use for very thin strips of materials, such as aluminum foil?
3. Which one of the following materials has the highest hardness?
   (a) Aluminum, (b) diamond, (c) steel, (d) titanium
4. Hardness is the ability of a material to

   A. Return to the original shape after being bent.

   B. Resist penetration.

   C. Stand deformation (bending) without breakage.

   D. Stretch before breakage.

1. The ultimate strength of steel in tension in comparison to shear is in the ratio of
   a) 1:1
   b) 2:1
   c) 3:2
   d) 2:3
2. The formula to find double shear strength is_____
   a) Load/Area
   b) Load/2XArea
   c) Load X Area
   d) Load X (2*Area)
3. The machine in which the double shear test conducted is _____
4. The number of pieces in double shear test of a steel rod after failure is_____
   a) 1
   b) 2
   c) 3
   d) 4

5. The number of pieces in single shear test of a steel rod after failure is_____
   a) 1
   b) 2
   c) 3
   d) 4
6. Unit of shear strength is_____

Key Answers:
1) C
2) B
3) UTM/ Compression Testing Machine
4) C
5) B
6) N/mm^2

COMPRESSIVE STRENGTH OF CONCRETE

1) Define compressive strength?
2) Define compressive strength of concrete?
3) What is the meaning of "M" in Grade M20

1. A first class brick when immersed in cold water for 24 hours should not absorb water more than
a) 15%
b) 20%
c) 22%
d) 25%
Ans: b

2. Crushing strength of a first class brick should not be less than
a) 3.5 N/mm2
b) 7.0 N/mm2
c) 10.5 N/mm2
d) 14.0 N/mm2
Ans: c

3. The main function of alumina in brick earth is
a) To impart plasticity
b) To make the brick durable
c) To prevent shrinkage
d) To make the brick impermeable
Ans: a

4. The percentage of alumina in a good brick earth lies between
a) 5 to 10%
b) 20 to 30%
c) 50 to 60%
d) 70 to 80%
Ans: b

5. Excess of alumina in brick earth makes the brick
a) Impermeable
b) Brittle and weak
c) To lose cohesion
d) To crack and warp on drying
Ans: d

6. The nominal size of the modular brick is
a) 190 mm x 90mmx 80 mm
b) 190 mm x 190 mm x 90 mm
c) 200 mm x 100 mm x 100 mm
d) 200 mm x 200 mm x 100 mm
Ans: c

7. Percentage of silica in a good brick earth lies between
a) 5 to 10%
b) 20 to 30%
c) 50 to 60%
d) 70 to 80%
Ans: c

8. Excess of silica in brick earth results in
a) Cracking and warping of bricks
b) Loss of cohesion
c) Enhancing the impermeability of bricks
d) None of the above
Ans: b

9. Which of the following ingredients of the brick earth enables the brick to retain its shape ?
a) Alumina
b) Silica
c) Iron
d) Magnesia
Ans: b

10. Which of the following pairs gives a correct combination of the useful and harmful constituents respectively of a good brick earth ?
a) Lime stone and alumina
b) Silica and alkalies
c) Alumina and iron
d) alkalies and magnesium
Ans: b

11. The process of mixing clay, water and other ingredients to make brick is Known as
a) Kneading
b) moulding
c) pugging
d) Drying
Ans: a

12. Advantage of a clamp compared to a kiln for burning bricks is that
a) It takes less time for burning
b) It gives more output of first class bricks
c) It has less initial cost
d) It is suitable when bricks are required in large numbers
Ans: c

13. The internal size of mould used in brick preparation is
a) Equal to the size of a fully burnt brick
b) Smaller than the size of a fully burnt brick
c) greater than the size of a fully burnt brick
d) None of the above
Ans: c

14. Pug mill is used for
a) Preparation of clay
b) moulding of clay
c) Drying of bricks
d) Burning of bricks
Ans: a

15. Which of the following bricks are used for lining of furnaces?
a) overburnt bricks
b) unburnt bricks
c) Refractory bricks
d) First class bricks
Ans: c

16. The frog of the brick in brick masonry is generally kept on
a) Bottom face
b) Top face
c) Shorter side
d) Longer side
Ans: b

17. Number of bricks required for one cubic metre of brick masonry is
a) 400
b) 450
c) 500
d) 550
Ans: c

1. In the cement test Vicat needle is used to the determination of
   a) Initial & final setting time
   b) fineness
   c) normal consistency
   d) specific gravity

2. In Vicat test, the final setting is assumed when the attachment of the needle fails to make any impression on the mould but the needle
   a) Penetrates the sample by 5 mm
   b) makes just an impression on the sample
   c) does not penetrate the sample
   d) pierce the sample by 10 mm

3. Initial setting time of cement should not be less than
   a) 15 minutes
   b) 30 minutes
   c) 28 minutes
   d) 1 hour (IES 1992)

4. Final setting time of cement should not be more than
   a) 1 hour
   b) 2 hours

c) 5 hours
d) 10 hours

5. Which of the following pairs in respect of ordinary Portland cement are correctly matched?
   1.Initial setting time……30 min. 2. Final setting time…….10 hours 3. Normal consistency…..10% 4.Soundness of cement is tested by Vicat apparatus
   Select the correct answer using the codes given below
   a) 1 and 4
   b) 2 and 3
   c) 1 and 2
   d) 1 and 3

6. The ability of cement to maintain a constant volume is called
   a) flashing
   b) honeycombing
   c) soundness
   d) creep
7. Soundness test of cement is done to determine its
   a) durability in sea water
   b) free lime content
   c) iron oxide content
   d) alumina content

8. Soundness of cement is tested by
   a) Vicat apparatus
   b) Le Chatalier apparatus
   c) soundness meter
   d) Duff Abrams apparatus

9. In the soundness test, the whole assembly is immersed in water at a temperature of
   a) 19 ± 1^0C
   b) 27 ± 1^0C
   c) 37 ± 1^0C
   d) 47 ± 1^0C

10. In the soundness test, the whole assembly is immersed in water for
    a) 30 minutes
    b) 1 hour
    c) 24 hours
    d) 48 hours

11. In the cement the compound quickest to react with water, is
    a) Tri caicium aluminate
    b) Tetra- calcim alumino-ferrite
    c) Tricalcium silicate
    d) Di- calcim silicate

12. Ultimate strength to cement is provided by
    a) Tri caiciumsilicate
    b) Di- calcim silicate
    c) Tricalcium aluminate
    d) Tetra calcium alumino ferrite

13. In a motor, the building material is
    a) Cement
    b) Sand
    c) Surkhi
    d) Cinders

14. The difference between 53 grade cement and 43 grade cement is
    a) Fineness & Compressive strength
    b) Soundness
    c) Tensile strength
    d) Color

15. For normal consistency test of OPC the attachment kept of movable rod is
    a) **Plunger(10mm dia 50mm long)**
    b) Needle ($1mm^2$)
    c) Needle with annular ring
    d) Needle ($2mm^2$)
16. The component added to increase the initial setting time in OPC is
    a) Gypsum
    b) Alumina
    c) Calcium
    d) Manganese

1. The resistance of the material to failure by impact is termed as ……..
   A) Strength
   B) Toughness
   C) Hardness
   D) None of these
2. In case of impact test, the aggregate kept in the mould is subjected to ……. Blows
3. The height of fall in case of impact test is ……mm
   A) 380mm
   B) 420mm
   C) 308mm
   D) 300mm
4. What is the test sample used in case of impact test?
5. What is the difference between impact load and crushing load
6. Los Angeles test is used to test aggregates for its abrasion resistance. (**True/False**)
7. List the test conducted to find the aggregate abrasion value
8. In case of aggregate crushing value the compression load is applied at the rate of ……. Tones/min.
   A) 40T/min
   B) 4T/min
   C) 400T/min
   D) 0.4T/min
9. Match the following
   A) 10% fineness test — shock
   B) Aggregate impact test — crushing
   C) Los Angeles test — abrasion

FINE AGGREGATE

1. The ability of aggregate to resist excessive changes in volume is referred as ……..
2. Define specific gravity
3. Differentiate between coarse aggregate and fine aggregate
4. Match the following
   A) Specific gravity — Oven drying method
   B) Moisture content — Sieve analysis
   C) Fineness modulus — Pyconometer
5. What is necessity of conducting Sieve Analysis in case of fine aggregate?
6. The aggregate fraction from 80mm to 4.75mm are termed as ……..
   A) Coarse aggregate
   B) Fine aggregate
   C) All-in aggregate
   D) Graded aggregate
7. For testing specific gravity, the sample should be dried to a constant mass at ……. º C
8. Differentiate between absolute specific gravity and apparent specific gravity.
9. Strength of quality of concrete depends on
   A) Aggregate shape
   B) Aggregate grading
   C) Surface area of the aggregate
   D) All of these
10. Maximum size of fine aggregate should not exceed 4.75mm (**True/False**)
11. Bulking of aggregate is due to …….
    A) Moisture content
    B) Absorbed water
    C) Voids
    D) Less compaction
12. If angularity number of a aggregate is increased when workability of concrete will ……
    A) Increase
    B) Decrease
    C) No change
    D) None of these

13. In concrete the fine Aggregate is used to fill up the voids in ……..
    A) Cement
    B) Coarse aggregate
    C) Sand
    D) None of these
14. According to IS 460-1962 sieve size varies from ……..
    A) 160mm to 25 µ
    B) 120mm to 50 µ
    C) 80mm to 75 µ
    D) None of these
15. Match the following
    A) Coarse aggregate

       passes through 4.75mm
    B) Fine aggregate

       retained on 4.75mm
    C) Dividing line between FA and CA

       4.75mm
16. Combination of Fine aggregate and Coarse aggregate is called …….
    A) Single sized aggregate
    B) Graded aggregate
    C) All-in aggregate
    D) All the above
17. Fineness modulus of fine aggregate is in the range of ……..
    A) 2-3.5
    B) 3.5-5
    C) 5-7
    D) 5-8.5
18. What is meant by fineness modulus?
19. If fineness modulus is 6.2, what does it indicate?
20. The nature of graph in fineness modulus is …… cuve.

1. The Minimum size of coarse aggregate is --------
2. The sieve analysis graph consists of % of ------- on Y axis and sieve size in log value x axis

a)passing b) retained c) cumulative passing d) cumulative retained

3. The size of coarse and fine aggregate is differentiated by
   a) >4.75 b)<4.75 c)=4.75 d) none of the above

4. The unit of fineness modulus is ------

5. The fineness modulus of fine aggregsate is 2.51, it can be graded as
   a) fine sand b) Medium sand c) Very fine sand d) coarse sand

6. The inert ingredient of a concrete mix is --------

7. Workability of concrete can be increased by
   a) increase in maximum size of aggregate b) decrease in temperature c) use of round aggregate which has smooth surface texture d) all of the above

8. The maximum nominal size of the coarse aggreagate is determined by sieve analysis and is designated by the sieve size hiher than the largest size on the the material retained is more than
   a) 5% b) 15% c) 25% d) 50%

9. Sieve analysis of coarse aggregate is done as per IS code-------

10. 150micron sieve size is equal to ----------mm

Answers:

1. 4.75 2. c) 3.c) 4.no unit 5.a) 6. Aggregate 7. d) 8. d)

9. 2386 (Part I) – 1963 10. 0.150

Objective type questions:

1. Increase volume of sand due to the pressure of surface moisture is called ----------

2. Bulking of sand is expressed in ----------
3. The bulking will be greater when the sand is
   a) Finer b) coarser) c)medium
4. Whether the following statement is true or false:
   The maximum volume is reached when all sand particles have their surface completely covered and pore spaces filled with water
5. Whether the following statement is true or false:
   The texure, surface tension and capillarity will affect the bulking of sand
6. Specify the Is code which gives the bulking characteristics of sand -------
7. When the sand is completely saturated with water , the volume in terms of dry sand can be taken
   a) Equal b) more c) less d) none of these
8. Differentiate fine and coarse sand by sieve size
   a) 4.25 b) 4.5 c) 4.75 d) 2.36
9. Bulking of sand is due to
   a) Viscosity b) air voids c) surface moisture d)porosity

10. The preferable measurement of sand is ---------batching

Answers:

1. Bulking of sand
2. 2. Percentage
3. 3. a)
4. 4. True
5. 5. True
6. 2386 (part III)-1963
7. a)
8. b)
9. c)
10. Weigh

1. Strength and quality of concrete depends on
   a. Aggregate shape
   b. aggregate grading
   c. Surface area of aggregate
   d. all of these
2. What is the normal range of absorption capacity of the coarse aggregate by weight of aggregate
   a) 0.2 to 0.5%
   b) b) 0.5 to 1%
   c) c) 1 t0 2%
   d) d) 2 to 3%
3. Say true or false for the following statement
   The absorption value not varies with aggregate derived from the sand, stone and other soft sand
4. In mix design calculation , the relative weight of the aggregates are based on the condition that the aggregate are
   a) Saturated and surface dry
   b) b) Saturated and surface moisture
   c) surface dry
   d) surface moisture
5. The coarse aggregate sample is immersed in water for------ hrs
6. Whether the following statement is true or false:

The sample for water absorption test on coarse aggregate is washed to remove the fine particles and dust

7. The unit of water absorption of coarse aggregate is expressed in-------

8. The water absorption test is conducted as per I.S code------

9. Say true or false for the following statement

Indian Road congress has specified the maximum water absorption value as

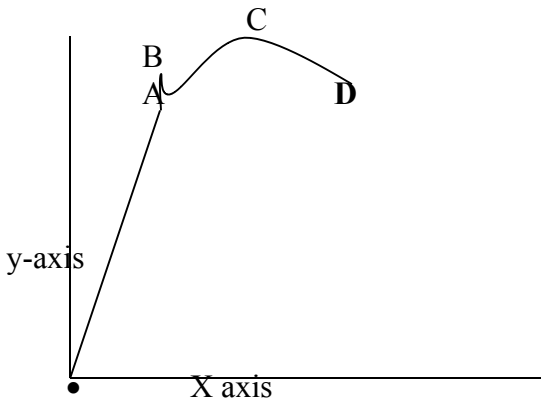
1.0 percent for aggregates used in bituminous surface dressing

10. Separation of ingredients from concrete during transportation is called
    a) Bleeding b) creep c) Segregation d) Shrinkage

Answers:

1. d)
2. 2. b)
3. 3. False
4. 4. a)
5. 5. 24
6. 6. True
7. 7. %
8. IS: 2386 (Part III) – 1963
9. True
10. c)

1. Define stress?
2. Define strain?
3. Define hooks law?
4. Ratio of stress and strain within elastic limits is called_____?
5. Expand UTM & CTM?
6. Difference between mild steel and HYSD bars ?
7. Define Elasticity, Plasticity, Mealibilty, Ductility, Brittle?
8. Mode of failure for Mild steel?
9. What is necking?
10. IS code for tension test?
11. What is the units of stress?
12. What is the unit of young's modulus?
13. What is the unit of strain?
14. Young's modulus of mild steel is - _____?
15. Define modulus of elasticity?
16. Define yield stress, proof stress, ultimate stress, breaking stress,?
17. Define percentage elongation, percentage reduction of area?
18. Draw the Typical stress-strain curve for mild steel?
19. Identify the Important parameter located in the graph



20. What is extensometer?
21. Difference between lateral strain and linear strain?

BULK DENSITY OF COARSE AGGREGATE

1. Define Bulk Density?
2. Bulk density of aggregate depends on _____
   a) Specific gravity b) water content c) compressive strength d) voids
3. Unit of Bulk density _____
4. Define percentage of voids
5. IS code specified for the test of bulking of aggregate is_____

6. Where and Why Bulk density of aggregate is required in field application.
7. Define grading of aggregate
8. Define well graded aggregate
9. Define uniform graded aggregate
10. What is the significance of bulk density on concrete
11. Difference between bulk density and Density
12. Difference between bulk density and relative density
13.

SPECIFIC GRAVITY OF CEMENT

1. Specific gravity of the cement is tested with_____ a)water b)kerosene c) acid d) base
2. Specific gravity of OPC ranges from_____
3. Ratio of weight of the material to its weight of equal volume of water is called _____
4. Relationship between specific gravity and density?
5. Specificgravity of water is _____?
6. If specific gravity of cement is 3.15 then what is the specific gravity of cement taken on the moon _____?
7. Relation between specific gravity and specific weight?
8. Match the following

a.	Cement	2.1 to 2.35
b.	CA	1.91 to 2.41
c.	FA	2.5 to 2.85
d.	Fly ash	3.15to 3.36
		4.5 to 5

9. Specific gravity of cement is is found as per code _____
10. Important parameter for designing heterogeneous material is _____
11. Unit of specifc gravity is_____ a)Gram b)Kg/cm c)meter d) no unit
12. Why water is not used in finding specific gravity of cement?
13. Which constituent of cement react first with addition of water?
14. How do you determine specific gravity of cement?

Specific gravity of coarse aggregates

1. Average specific gravity of the rocks vary from,
   a) <u>2.6 to 2.8</u>
   b) 2.8 to 3.0
   c) 3.0 to 3.2
   d) 3.2 to 3.4
2. Specific gravity of Coarse Aggregate is made use of in design calculation of _____
   a) Concrete Mix Design
   b) Volume Determination
   c) Weight Determination
   d) <u>All of the above</u>
3. Apparatus used find out Specific Gravity of Coarse Aggregate
   a) Pycnometer
   c) Specific Gravity Bottle
   b) Density Bottle
   d)**<u>Wire Basket</u>**
4. Specific Gravity is an indicator of
   a) <u>How heavy a material is.</u>
   b) How lighter a material is
   c) How porous a material is
   d) How stronger material is
5. Specific gravity is the ratio of _____
6. Specific Gravity of aggregates ranges from
   a) 3.0 to 3.5 b) **<u>2.5 to 3.0</u>**
   b) 3.15 to 3.65 d) 2.0 to 2.5
7. Water Absorption of aggregates ranges from
   a) 0.5% to 1.6%
   b) 0.8% to 1.8%
   c) <u>0.1% to 2.0%</u>
   d) 1.0% to 3.0%
8. To what temperature the aggregates are kept in oven in case of Sp. Gravity test.
   a) 120^0C
   b) <u>110^0C</u>
   c) 95^0C
   d) 100^0C

9. For how much time the aggregates are kept in oven in case of Sp. Gravity test.
   e) 12hrs
   f) <u>24hrs</u>
   g) 18hrs
   h) 3hrs
10. Size of Wire Basket mesh should not exceed.
    a) 4.75mm c) 10mm
    b) **6.3mm** d) 2.36mm

Flakiness and Elongation Index

1. Apparatus used to perform flakiness test is?
   a) Length Gauge
   b) Thickness Gauge
   c) Meter Gauge
   d) Screw Gauge
2. Apparatus used to perform elongation test is?
   a) Meter Gauge
   b) Length Gauge
   c) Thickness Gauge
   d) Screw Gauge
3. Flakiness and Elongation test is not applicable to sizes,
   a) Smaller than 6.3mm
   b) Smaller than 10mm
   c) Smaller than 12.5mm
   d) Smaller than 4.75mm
4. Flaky and Elongated Particles are considered undesirable in pavement construction.
   a) True
   b) False
5. The flakiness index of the aggregates is the percentage by weight of particle whose least dimension is less than _____
   a) $2/5^{th}$ of their mean dimension
   b) $1/5^{th}$ of their mean dimension
   c) $4/5^{th}$ of their mean dimension
   d) $3/5^{th}$ of their mean dimension
6. The Elongation index of the aggregates is the percentage by weight of particle whose greatest dimension is greater than _____
   a) $1\frac{2}{5}$ of their mean dimension
   b) $2\frac{2}{5}$ of their mean dimension
   c) $1\frac{4}{5}$ of their mean dimension
   d) $2\frac{4}{5}$ of their mean dimension
7. The percentage by weight of particle whose least dimension is less than $3/5^{th}$ of their mean dimension is called as_____
   a) Angularity Number c)elongation index
   b) **flakiness index** d)none of the above
8. The percentage by weight of particle whose greatest dimension is greater than $1\frac{4}{5}$ th of their mean dimension is called as_____
   a) Angularity Number
   b) **elongation index**
   c) flakiness index
   d) none of the above
9. Flakiness index is the percentage by weight of particles _____
   a) **Passed** c)Retained
   b) Neither a nor b d)none of the above
10. Elongation index is the percentage by weight of particles _____
    a) Passed **c)Retained**
    b) Neither a nor b d)none of the above
11. Flakiness and Elongation tests are categorized under_____
    a) Size Test c) Strength test
    b) **Shape Test** d) Durability test
12. Flakiness and Elongation is described under which IS Code:
    a) IS 2386 part-I
    b) IS 2386 part-II
    c) IS 2386 part-III
    d) IS 2386 part-IV

13 Aperture size of the smallest sieve used in Flakiness and Elongation test
   a) 6.3mm IS Sieve
   b) 4.75mm IS Sieve
   c) 2.36mm IS Sieve
   d) 1.18mm IS sieve
14 Aperture size of the Largest sieve used in Flakiness and Elongation test
   a) 80mm IS Sieve
   b) 70mm IS Sieve
   c) 63mm IS Sieve
   d) 50mm IS sieve
15 The particle shapes are determined by_____
   a) Sieve Analysis
   b) Flakiness and Angularity
   c) Elongation and Angularity
   d) Both b and c

1. In what way the values of impact energy will be influenced if the impact tests are conducted on two specimens, one having smooth surface and the other having scratches on the surface?
2. What is the effect of temp? On the values of rupture energy and notch impact strength?
3. What is resilience? How is it different from proof resilience and toughness?
4. What is the necessity of making a notch in impact test specimen?
5. If the sharpness of V-notch is more in one specimen than the other, what will be its effect on the test result?

1. The slump test is used to measure_____
2. What is the slump value of concrete for road work
   a) 20 to 30
   b)50 to 100
   c) 75 to 150
   d)12 to 25

3. What is the slump value of ordinary RCC work for beams and slabs

   a) 20 to 30
   b) 50 to 100
   c) 75 to 150 d) 12 to 25

4. Increase in slump may indicate

   a) Increase in moisture content of aggregate
   b) Change in grading of aggregate
   c) Both a and b

   d) None of the above