

**S'11:4FN : CV403 (1429)**

**CIVIL ENGINEERING MATERIALS AND  
CONSTRUCTION PRACTICES**

*Time : Three hours*

*Maximum Marks : 100*

*Answer FIVE questions, taking ANY TWO from Group A,  
ANY TWO from Group B and ALL from Group C.*

*All parts of a question (a, b, etc.) should  
be answered at one place.*

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**Group A**

1. (a) Elaborately discuss the engineering properties of civil engineering materials such as concrete, steel, stone and timber that are considered for selecting these materials. 10
- (b) Describe the classifications, properties and uses of five important types of stone employed in civil engineering work. 10
2. (a) Name different processes of manufacture of steel and describe one process in detail with the help of a flow-chart. 10

- (b) Describe different rolled sections of structural steel with neat sketches and state their uses. 5
- (c) What are the hot-weather problems associated with large concrete volumes in the fresh state and what should be the precautions taken? 5
3. (a) Describe, with the help of flow-sheet, manufacturing of cement by dry process. Why is dry process preferred to wet process? 10
- (b) Describe briefly, with applications, (i) high early strength cement, (ii) low alkali cement, and (iii) rapid hardening cement. 3 × 2
- (c) How do you propose to make timber structures more fire-resistant? 4
4. (a) Describe desirable properties and functions of different constituents of concrete. 10
- (b) Describe different admixtures used in concrete for improving some specific qualities by them. 6
- (c) Write a short note on properties and applications of fibre reinforced concrete. 4

**Group B**

5. (a) What are the required qualities of good brick earth? 5
- (b) Describe the properties of class I type of bricks. 5
- (c) Explain, with the help of neat sketches, the manufacture of bricks by Bull's trench kiln. 10
6. (a) Briefly describe any three methods of non-destructive tests for concrete. 7

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(Continued)

- (b) What are the measures taken to prevent deterioration and for increasing the durability of civil engineering structures? 7
- (c) What are the safety measures taken during construction of major civil engineering projects? 6
7. (a) Describe the methods of assessing the quantities of materials and estimating procedure of a civil engineering project. 10
- (b) Describe the method of preparation of a tender document. 10
8. (a) Describe in detail about (i) unit rate contract, (ii) lumpsum contract, and (iii) turnkey contract. 10
- (b) Describe how to apply the techniques (i) CPM, (ii) bar charts, and (iii) pie diagram for managing the construction schedule of a civil engineering project. 10

**Group C**

9. Choose the correct answer for the following: 20 × 1
- (i) Seasoning of timber is required to
- (a) soften the timber.  
(b) harden the timber.  
(c) straighten the timber.  
(d) remove sap.
- (ii) The drawback of electric seasoning of timber is
- (a) checks.  
(b) splitting.  
(c) cracks.  
(d) reduced strength.

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- (iii) Marble is quarried by
- (a) blasting.
  - (b) excavating.
  - (c) heating.
  - (d) wedging.
- (iv) Which one of the following is the hardest mineral ?
- (a) Quartz
  - (b) Feldspar
  - (c) Garnet
  - (d) Talc
- (v) Soundness test of cement is performed by
- (a) Vicat's Apts
  - (b) Le Chatelier's Apts
  - (c) Nurse and Blains Apt
  - (d) All of the above.
- (vi) To produce low heat cement, it is necessary to reduce the compound
- (a)  $C_3S$
  - (b)  $C_2S$
  - (c)  $C_3A$
  - (d)  $C_4AF$
- (vii) If  $p$  is the standard consistency of cement, the amount of water used in conducting the initial setting time test on cement is
- (a) 0.65 p
  - (b) 0.85 p
  - (c) 0.6 p
  - (d) 0.8 p
- (viii) For marine works, the best suited cement is
- (a) low heat portland cement.
  - (b) rapid hardening cement.
  - (c) ordinary portland cement.
  - (d) blast furnace slag cement.
- (ix) Which one of the following aggregates gives maximum strength in concrete ?
- (a) Rounded aggregate
  - (b) Elongated aggregate
  - (c) Flaky aggregate
  - (d) Cubical aggregate
- (x) The maximum bulking of sand is likely to occur at a moisture content of
- (a) 5 %
  - (b) 8 %
  - (c) 11 %
  - (d) 14 %.
- (xi) Which one of the following is caustic lime ?
- (a) Quick lime
  - (b) Fat lime
  - (c) Milk of lime
  - (d) Hydraulic lime.
- (xii) Hydraulic lime is obtained by burning
- (a) oolitic lime
  - (b) kankar
  - (c) marble
  - (d) tufa.

- (xiii) The best application of puzzolana cement in concrete is
- (a) dams.
  - (b) bridges.
  - (c) RCC slab.
  - (d) domes.
- (xiv) The approximate ratio between the strengths of cement concrete at 7 days and 28 days is
- (a)  $\frac{3}{4}$
  - (b)  $\frac{2}{3}$
  - (c)  $\frac{1}{2}$
  - (d)  $\frac{1}{3}$
- (xv) The minimum mixing time of cement concrete (in min) should be
- (a) 2
  - (b) 4
  - (c) 6
  - (d) 10
- (xvi) To make one cubic metre of 1 : 2 : 4 by volume concrete, the volume of coarse aggregate required is
- (a)  $0.94 \text{ m}^3$
  - (b)  $0.85 \text{ m}^3$
  - (c)  $0.75 \text{ m}^3$
  - (d)  $0.65 \text{ m}^3$
- (xvii) With the same W/C ratio, the lower the maximum size of aggregate, the strength of concrete
- (a) increases.
  - (b) decreases.
  - (c) remains same.
  - (d) cannot say.
- (xviii) The ultimate tensile strength of high carbon steel (in  $\text{N/mm}^2$ ) is
- (a) 600
  - (b) 1000
  - (c) 1500
  - (d) 2000
- (xix) Which constituent helps brick to maintain its shape ?
- (a) Silica
  - (b) Lime
  - (c) Alumina
  - (d) Magnesia
- (xx) Operation takes place in pug mill is
- (a) weathering.
  - (b) blending.
  - (c) tempering.
  - (d) burning.

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**Group A**

1. (a) Explain the manufacturing process of thermo-  
mechanically treated (TMT) steel. 5
- (b) Describe the process of hydration of cement and state  
its significance in mass concreting. 5
- (c) What are admixtures ? Why are they used in concrete ? 5
- (d) Define following properties of materials : (i) creep,  
(ii) elasticity, (iii) ductility, (iv) density, (v) flexibility. 5
2. (a) Differentiate between cast iron and stainless steel. 5
- (b) State different components of cement alongwith their  
chemical composition. 5

*( Turn Over )*

- (c) Define workability of concrete and explain its significance. 5
- (d) What is honeycombing? How can it be avoided? 5
3. (a) What are different forms of structural steel and explain any one of them? 5
- (b) Explain different types of cements. 5
- (c) State and explain factors affecting durability of concrete. 5
- (d) Define (i) fatigue, (ii) impact strength, (iii) toughness, (iv) thermal conductivity, and (v) malleability. 5 × 1
4. (a) State the properties of steel for prestressed concrete. 5
- (b) With the help of flow-chart, explain the wet process of manufacture of cement. 5
- (c) Differentiate between mineral and chemical admixtures. 5
- (d) State any three physical and two chemical properties of cement. 5
- Group B**
5. (a) Explain the working of vertical shaft brick kiln. 5
- (b) What is depreciation? Explain types of depreciation. 5
- (c) In a retaining wall construction, *A, B, and C* represent shuttering operations for three bays of wall and *P, Q and R* represent corresponding and concreting operations. Assume that, in each case, shuttering has to precede concreting. Only one crew for formwork and one for concreting operation is available. Show dummies in the CPM network, representing the restraints and the consequent interdependence. 10
6. (a) Explain classification of bricks as per IS 1077-1992. 5
- (b) State any two devices of non-destructive testing and explain their principle. 5
- (c) State any four methods of depreciation. A civil engineering structure was constructed at the cost of ₹ 50,000 before 40 years. If the estimated life of the structure is 90 years, determine the present value of structure. Consider the scrap value as 15% of cost of construction. 10
7. (a) State any five desirable properties of good bricks. 5
- (b) What is tender? State any four types of tender and explain any one of them. 5
- (c) What is the concept of quality? State any three stages of quality control. Explain any three basic elements of quality. 3 + 3 + 4
8. (a) With the help of a sketch, explain Gantt bar chart. What are shortcomings of a Gantt bar chart? 5
- (b) Define the following : 5 × 1
- (i) Optimum time estimation
- (ii) Most likely time estimation
- (iii) Pessimistic time estimation
- (iv) Expected time estimation
- (v) Critical path.
- (c) State any five measures to be taken for quality control for improving engineering properties of bricks. 10

**Group C**

9. Choose the *correct* answer for the following : 10 × 2
- (i) The metamorphic rocks are structurally changed forms of
- (a) sedimentary rocks.
  - (b) sand stones.
  - (c) mud.
  - (d) organic matter.
- (ii) Silica, in brick, provides
- (a) colour to brick.
  - (b) hardness and durability to brick.
  - (c) shrinkage to brick.
  - (d) cracks to brick.
- (iii) Quicklime is produced through the process of
- (a) oxidation.
  - (b) decomposition.
  - (c) calcination.
  - (d) heat of hydration.
- (iv) Soundness of cement is related to
- (a) strength of cement.
  - (b) pollution of cement.
  - (c) thermal expansion of cement.
  - (d) water-cement ratio.
- (v) Heat of hydration is a process in which
- (a) heat is generated.
  - (b) heat is reflected.
  - (c) heat is absorbed.
  - (d) heat is converted.
- (vi) Mortar is prepared using
- (a) cement and coarse aggregate.
  - (b) cement and fine aggregate.
  - (c) coarse and fine aggregate.
  - (d) cement and water.
- (vii) Separation of cement paste from the mix in case of lean and wet mix is known as
- (a) segregation.
  - (b) honeycombing.
  - (c) weeping.
  - (d) bleeding.
- (viii) Tensile strength of concrete is determined by
- (a) impact test.
  - (b) compression test.
  - (c) splitting test.
  - (d) slump test.
- (ix) Corrosion of steel reinforcement in concrete can be avoided by
- (a) providing colour to concrete.
  - (b) providing formwork.

- (c) providing cover.
- (d) providing fibres.
- (x) N.D.T. is used for determining
  - (a) strength of concrete.
  - (b) impact resistance of concrete.
  - (c) creep of concrete.
  - (d) workability of concrete.

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**Group A**

1. (a) Explain the method and procedure of durability test  
which would be conducted to determine the following  
durability aspect of stone: 3 + 3 + 4
  - (i) Resistance to wear
  - (ii) Coefficient of hardness
  - (iii) Toughness of the stone.
- (b) How are engineering materials classified ? Discuss  
in detail the mechanical and engineering properties of  
the material stating its significance. 10

*( Turn Over )*

2. (a) What is the effect of adding the following elements in iron?  $4 \times 2$   
(i) Nickel, (ii) copper, (iii) tungsten, and (iv) carbon.
- (b) What do you mean by allotropy? What is its purpose? 6
- (c) Classify steel according to its use? Discuss in brief the use of TMT bar in RCC constructions. 6
3. (a) What are the various ingredients of ordinary portland cement? Discuss the function played by each in imparting specific properties to the cement. 10
- (b) What is cement hydration? Why is it important? Critically review the Bogue compounds and their properties. 10
4. (a) What is the specific need of fiber reinforced concrete? Brief different types of fibers used in concrete. Also, mention their properties, advantages, limitations, and applications. 10
- (b) What is pozzolona? How is it classified? Comment about the use of different types of pozzolona in concrete. 10
- Group B**
5. (a) What should be the length and breadth of a brick? Why is this proportion important in masonry construction? 3
- (b) What are the field tests to judge the qualities of brick? Explain in brief. 6
- (c) Why is sand added to brick earth? 3
- (d) Differentiate between the following terms: (i) Country brick, (ii) modular brick, (iii) table moulded brick, and (iv) wire cut brick.  $4 \times 2$
6. What type of non-destructive test you would recommend in the following situations and why? Also, discuss the procedure to determine the test:  $2 \times 10$
- (i) To check the specification compliance involving aggregate-cement ratio.
- (ii) To measure the concrete uniformity after placing the concrete.  
Support your answer with simple and a neat sketch.
7. (a) What are the shortcomings of bar charts? How can these be removed? Explain in detail. Support your answer with simple and neat sketches. 10
- (b) Draw a typical cost-duration curve and show optimum duration and minimum cost – explain. 10
8. (a) Write short notes on the following:  $4 + 4$
- (i) Value engineering
- (ii) Breach of contract
- (b) Explain the concept of quality control of concrete at site. How can it be achieved? 6
- (c) Give reason for the following:  $3 \times 2$
- (i) Security money cannot be refunded to the contractor immediately after handing over the building.
- (ii) Sinking fund calculation is applied for building but not for land.
- (iii) Lowest tender can be rejected even if adequate competition and lowest rates are available.

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(Continued)

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**Group C**

9. Choose the *correct* answer for the following : 10 × 2
- (i) Water \_\_\_\_ is defined as capacity of a material to permit water to pass through it under pressure.
- (a) porosity  
(b) permeability  
(c) hygroscopicity  
(d) density index
- (ii) In a stone masonry, the direction of the pressure line is
- (a) Inclined to natural bed at 30°.  
(b) Inclined to natural bed at 45°.  
(c) Inclined to natural bed at 60°.  
(d) perpendicular to natural bed.
- (iii) Swollen structure and white patches will be found in bricks due to
- (a) carbon.  
(b) bituminous matter.  
(c) organic matter.  
(d) sulphur.
- (iv) Which one of the following is not an objective of seasoning timber ?
- (a) Reduction in shrinkage and warping.  
(b) Reduction of weight.  
(c) Reduction of natural defects in timber.  
(d) Increase in strength and durability.
- (v) For complete hydration of cement, the water/cement ratio needed is
- (a) more than 0.35 but less than 0.45.  
(b) more than 0.45 but less than 0.50.  
(c) more than 0.45 but less than 0.60.  
(d) less than 0.25.
- (vi) Blast furnace slag has approximately
- (a) 50% alumina and about 20% calcium oxide.  
(b) 45% calcium oxide and about 35% silica.  
(c) 25% magnesia and 15% alumina.  
(d) 25% calcium oxide and about 35% silica.
- (vii) Consider the following statements :  
The effect of air entrainment in concrete is to
1. increase resistance to freezing and thawing.
  2. improve workability.
  3. decrease strength.
- Which one of the above statements is/are correct?
- (a) 1, 2 and 3  
(b) 1 and 2  
(c) 1 only  
(d) 2 only.
- (viii) IS : 1664-1982 refers to
- (a) safety measure for excavation.  
(b) safety measure for fire.  
(c) fire safety of electrical installation.  
(d) safety measure of demolition.

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(Continued)

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- (ix) Earnest money deposit is to be remitted while
- (a) offering the tender schedule.
  - (b) during work execution.
  - (c) getting completion of certificate.
  - (d) award of work.
- (x) Need of approximate estimate of the project is to assess the
- (a) approximate cost of the project.
  - (b) material required for the project.
  - (c) time required for completion of the project.
  - (d) viability of the project.

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**Group A**

1. (a) Describe important characteristics, features and uses  
of the following rocks : (i) Granite, (ii) sandstone,  
(iii) marble, (iv) shale, and (v) basalt. 5 × 2
- (b) Explain the following : (i) Modulus of elasticity,  
(ii) fatigue limit, (iii) creep, and (iv) shrinkage. 3+3+2+2
2. (a) Describe the manufacture of cement with the help of  
a line diagram by wet process. 11
- (b) Explain the preparation and uses of the following types  
of concrete : 3 × 3
  - (i) High early strength concrete
  - (ii) Low alkali concrete
  - (iii) Rapid hardening concrete.

3. (a) How has steel been classified by ISI ? State with illustrations. 10
- (b) What are the environmental factors affect various engineering materials ? Describe their effects in detail. 10
4. (a) What are the major constituents of a concrete ? Describe the functions of each. How is controlled concrete manufactured ? 10
- (b) For what purposes admixers are used in concrete ? Name five admixers popularly used in concrete, stating the functions of each. 10

**Group B**

5. (a) Describe, with the help of a neat sketch, the manufacturing process of bricks by Bull's trench method. 8
- (b) Explain the desirable qualities of good earth required for manufacture of bricks. 6
- (c) Discuss the properties of A-class bricks. 6
6. (a) Describe the methods of evaluation of civil engineering structures. 8
- (b) Explain various methods of non-destructive tests of materials. 6
- (c) Make a comparison between Bull's trench method and Hoffmann's method. 6
7. (a) How can best workmanship be achieved during concrete construction ? 6

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( Continued )

- (b) Describe the methods of safety measures taken during construction of a multistoreyed building in a congested place. 8
- (c) Describe different types of contracts used in practice. 6

8. During construction of a multistoreyed building, duration of various activities for each floor is given below :
- (A) Building planning and design 7 days
- (B) Layout 2 days
- (C) Construction of foundation 20 days
- (D) Superstructure (walls and columns) up to roof level 30 days
- (E) Door/window frame fixing 7 days
- (F) Roof construction 40 days
- (G) Electrical conduit 7 days
- (H) Laying drainage pipes 7 days
- (I) Laying water pipes 7 days
- (J) Plastering work 15 days
- (K) Paris work 10 days
- (L) Laying electrical wiring/fittings 10 days
- (M) Fixing sanitary/water fittings 7 days
- (N) Finishing/colour washing/roof treatment/flooring 16 days
- Choose the activities in a proper sequence and prepare the CPM network and then determine the total project duration for a six-storeyed building. 20

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**Group C**

9. Answer the following in brief : 10 × 2
- (i) State the geological classification of rocks.
  - (ii) What are *two* major groups of plastics ?
  - (iii) Soundness of cement is generally carried out by which apparatus ?
  - (iv) Initial setting time, final setting time and consistency tests of cement are generally carried out by which apparatus ?
  - (v) In a plywood board, the number of plies that should be acceptable is
    - (a) 6
    - (b) 7
    - (c) 8
  - (vi) Define 'shotcrete' in brief.
  - (vii) What do you understand by sinking fund ?
  - (viii) What do you understand by earnest money ?
  - (ix) What do you understand by security deposit ?
  - (x) Mention the respective dimension of (a) standard bricks, and (b) modular bricks.

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**Group A**

1. (a) Name different physical properties of building materials with brief explanation of each of them. 6
- (b) What are the chemical compounds formed during setting action of cement? For quick hardening of cement concrete, which one of such compounds will be responsible? 3 + 1
- (c) What are the steps in manufacturing normal setting ordinary cement? Explain the dry and wet processes involved in such manufacturing with the help of flow diagrams. 4 + 6
2. (a) Explain different types of defects in timber. What should be the qualities for good timber? 3 + 3

- (b) What are the differences between wrought iron and steel? Explain various factors affecting physical properties of steel. 3 + 4
- (c) Explain the differences between reinforced concrete and prestressed concrete. What are the reasons for losses in prestress? 3 + 4
3. (a) What are meant by water-cement ratio and workability of fresh concrete? Describe slump test and indicate values of slump for various types of works. (2 × 2) + 4 + 2
- (b) State the purposes of using admixtures in concrete. Explain the care that should be taken during placing concrete. 2 + 2
- (c) What is meant by fibre-reinforced concrete? What are the advantages and disadvantages of such concrete? 2 + (2 × 2)
4. (a) Name some of the methods used for non-destructive testing in fresh concrete and hardened concrete. What are the advantages of such testings? 3 + 3
- (b) Explain the terms (i) mild steel, (ii) high carbon steel, and (iii) high tensile steel. 3 × 2
- (c) Write short notes on the following: 4 × 2
- (i) Cold twisted deformed bars
- (ii) Thermo-mechanically treated bars

**Group B**

5. (a) What are the requirements for good brick earth? 5
- (b) How are burnt bricks classified? State the uses of each such classified bricks. 3 + 3

- (c) Name different tests conducted for finding the suitability of bricks. Explain the water absorption test and state the permissible value from such test for bricks to be allowed for use in construction. 3 + 4 + 2
6. (a) What are common rock-forming minerals? Describe the characteristics of the good building stones. Explain fire-resistance test for stone. 3 + 6 + 3
- (b) Name important usages of geosynthetic fabrics in civil engineering constructions. State the advantages of such applications. 4 + 4
7. (a) Write short notes on *any two* of the following: 2 × 4
- (i) Bill of quantities contract
- (ii) Contract document
- (iii) Calling tender.
- (b) What are the advantages of network diagram? 4
- (c) A construction company has to submit a bid for construction of a building. From specification, PERT network along with three time estimates (in weeks) were made and shown in Fig. 1. Determine the critical path and its standard variation. 6 + 2

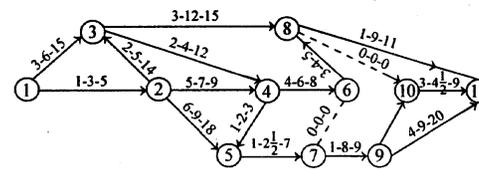


Fig. 1

8. (a) Describe briefly the general safety programme for construction. What are the protective equipment provided to workers for safety during construction. 6 + 2  
(b) State the advantages of reinforced brick works. 3  
(c) Explain the causes of dampness in masonry construction. 4  
(d) What are the reasons for preparation of surface for plastering? Name some common types of plaster. 3 + 2

**Group C**

9. Choose the *correct* answer for the following : 20 × 1
- (i) Loss of stress with time at constant strain in steel is called  
(a) relaxation.  
(b) creep.  
(c) shrinkage.  
(d) ductility.
- (ii) The compressive strength of concrete determined from 150 mm × 150 mm cylinder as compared to that determined from 150 mm × 300 mm cylinder is  
(a) more.  
(b) less.  
(c) equal.  
(d) uncertain.
- (iii) The diameter of the needle used in Vicat's apparatus for determination of initial setting time is prescribed as  
(a) 0.5 mm  
(b) 1 mm  
(c) 5 mm  
(d) 10 mm

- (iv) As compared to ordinary portland cement, high alumina cement has  
(a) higher initial setting time but lower final setting time.  
(b) lower initial setting time but higher final setting time.  
(c) higher initial and final setting times.  
(d) lower initial and final setting times.
- (v) Upper yield point in the stress-strain curve in structural steel can be avoided by  
(a) cold working.  
(b) hot working.  
(c) quenching.  
(d) galvanizing.
- (vi) For isotropic homogeneous elastic materials obeying Hooke's law, number of independent elastic constants is  
(a) 2  
(b) 3  
(c) 9  
(d) 36
- (vii) The role of superplasticizer in a cement paste is to  
(a) disperse the particles.  
(b) disperse the particles and to remove air bubbles.  
(c) disperse the particles to remove the air bubbles and to retard setting.  
(d) retard setting.

- (viii) Electrostatic precipitators are used as pollution control device for separation of
- (a)  $\text{SO}_2$
  - (b)  $\text{NO}_2$
  - (c) hydrocarbon.
  - (d) particulate matter.
- (ix) Efflorescence of bricks is due to
- (a) soluble salts present in clay for making bricks.
  - (b) high porosity of bricks.
  - (c) high silt content in brick earth.
  - (d) excessive burning of bricks.
- (x) The specific gravity of most of stones lie between
- (a) 1.8 and 2.2
  - (b) 2.5 and 3.0
  - (c) 3.0 and 3.5
  - (d) 3.5 and 4.5
- (xi) Which one of the following aggregates gives maximum strength in concrete ?
- (a) Rounded aggregates.
  - (b) Elongated aggregates.
  - (c) Flaky aggregates.
  - (d) Cubical aggregates.
- (xii) The upper limit of suspended particles in water for preparation of concrete is
- (a) 200 ppm
  - (b) 2000 ppm
  - (c) 5000 ppm
  - (d) 10,000 ppm
- (xiii) Ultrasonic pulse velocity method is used to determine
- (a) compressive strength of concrete.
  - (b) impact resistance of concrete.
  - (c) tensile strength of concrete.
  - (d) quality of concrete.
- (xiv) Crudest form of iron is
- (a) mild steel.
  - (b) pig iron.
  - (c) wrought iron.
  - (d) cast iron.
- (xv) In mild steel, the iron content is about
- (a) 50%
  - (b) 80%
  - (c) 95%
  - (d) 99%
- (xvi) Polyvinyl chloride (PVC) is a
- (a) thermosetting material.
  - (b) thermoplastic material.
  - (c) elastoplastic material.
  - (d) rigid plastic material.
- (xvii) In the time cost optimisation using CPM method of network analysis, the crashing of the activities along the critical path is done starting with activity having
- (a) longest duration.
  - (b) highest cost slope.
  - (c) least cost slope.
  - (d) shortest duration.

(xviii) Sinking fund is

- (a) the fund for rebuilding a structure when its economic life is over.
- (b) raised to meet maintenance costs.
- (c) the total sum to be paid to the municipal authority by the tenants.
- (d) part of money kept in reserve for providing additional structural modifications.

(xix) Property of steel due to which it can withstand the blow of hammers is

- (a) hardness.
- (b) toughness.
- (c) malleability.
- (d) plasticity.

(xx) Galvanizing is done with a thin layer of

- (a) copper.
- (b) zinc.
- (c) lead.
- (d) cadmium.

**W'13:4FN: CV403 (1429)**

**CIVIL ENGINEERING MATERIALS AND  
CONSTRUCTION PRACTICES**

*Time : Three hours*

*Maximum Marks : 100*

*Answer FIVE questions, taking ANY TWO from Group A,  
ANY TWO from Group B and ALL from Group C.*

*All parts of a question (a, b, etc.) should  
be answered at one place.*

*Answer should be brief and to-the-point and be supplemented  
with neat sketches. Unnecessary long answers may  
result in loss of marks.*

*Any missing or wrong data may be assumed suitably giving  
proper justification.*

*Figures on the right-hand side margin indicate full marks.*

**Group A**

1. (a) Discuss in brief and in comparative manner any five of the following properties of steel and concrete from civil engineering point of view : 5 × 2
- (i) Density
  - (ii) Creep
  - (iii) Modulus of elasticity
  - (iv) Fire-resistance
  - (v) Shrinkage
  - (vi) Ductility
  - (vii) Compressive strength
  - (viii) Tensile strength

- (b) Clearly classify various types of defects in timber. 5
- (c) What is the importance of use of proper bedding and dressing in stone works. 5
2. (a) What do you mean by proportioning of concrete? Discuss in brief various methods of determining the volumetric proportion of various ingredients of concrete. 10
- (b) Discuss about the impact of any five of the following in cement concrete : 5 × 2
- Curing
  - Temperature
  - Grading of aggregate
  - Type (quality) of cement
  - Water cement ratio
  - Admixtures
3. (a) Discuss in brief any three steel sections available in market and widely used in building construction works. 5
- (b) Differentiate between dry and wet processes of cement manufacturing. In your view which method is better and why? 2 × 4 + 2
- (c) Estimate the yield of concrete per bag of cement concrete mix 1 : 3 : 6 and water cement ratio = 0.6. Use the following data for calculation : 5
- | Ingredient       | Cement                      | Sand                   | Aggregate              | Water                  |
|------------------|-----------------------------|------------------------|------------------------|------------------------|
| Specific Gravity | 3.15                        | 2.65                   | 2.8                    | 1                      |
| Unit weight      | 0.035 m <sup>3</sup> /50 kg | 1600 kg/m <sup>3</sup> | 1500 kg/m <sup>3</sup> | 1000 kg/m <sup>3</sup> |
4. (a) Discuss any two of the following in brief : 2 × 5
- Various tests in stone to assess the impact of environment and wear and tear
  - Main process of heat treatment in steel
  - Natural and artificial seasoning of timber
  - Types of cements used in concrete
- (b) Why is there need of reinforcement in concrete? What impact does it make towards the strength of structure of any two of the following : 2 + 2 × 4
- Use of different types of steel
  - Use of different steel section
  - Use of reinforcements (e.g. steel) at different places (locations) in concrete structure.
- Group B**
5. (a) Discuss main constituents of a good quality brick. Also, give emphasis on the main properties of materials which are harmful for brick. 5
- (b) Explain, with reasonable viewpoints, the importance of size, shape and weight of a brick for civil engineering construction works. 5
- (c) Compare clamp burning bricks and kiln burning bricks? 5
- (d) Explain the properties of bricks which need to be improved in superior quality and high strength civil engineering construction works. 5
6. (a) Discuss different types of contract systems and general conditions of a civil engineering work contract. 10

- (b) Describe briefly *any five* of the following terms with suitable examples : 5 × 2
- (i) Annuity
  - (ii) Outgoings
  - (iii) Scrap value
  - (iv) Escalation
  - (v) Obsolescence
  - (vi) Salvage value
  - (vii) Sinking fund

7. (a) Briefly explain different types of estimates. Give an example of most suitable civil engineering work associated with that particular type of estimate. 10
- (b) Differentiate between destructive and non-destructive testing. Explain in brief *any two* non-destructive testing methods used in civil engineering. 10
8. (a) Differentiate between unit rate contract, lump sum contract and turnkey projects. 5
- (b) What are different methods of time scheduling in civil engineering construction activities? What were the limitations of bar charts that led to development of critical path method and network methods? 5
- (c) Why is there need of standards to be fixed for civil engineering works? Discuss in brief about the Indian Standard code for concrete and . 5
- (d) What are the general principles of inspection of civil engineering works and what are the main items requiring quality control? 5

**Group C**

9. Answer the following in brief : 10 × 2
- (i) Classify the rock types according to their geological origin. Also, give names of at least two stones associated with them.
  - (ii) Discuss different types of lime used in civil engineering applications.
  - (iii) Classify various types of mortar.
  - (iv) Define corrosion of steel and give its causes.
  - (v) What is tender? Name different types of tenders.
  - (vi) What are the safety measures taken during the construction of a multistoried building?
  - (vii) What is carbonation of concrete? State its ill effects?
  - (viii) What measures will you adopt to prevent deterioration of a building having its structural members (items) made of concrete, brick, timber, steel, etc.
  - (ix) What is FIDIC document?
  - (x) What do you know about AASHTO and IRC codes?

**W'14: 4FN: CV403 (1429)**

**CIVIL ENGINEERING MATERIALS AND  
CONSTRUCTION PRACTICES**

*Time : Three hours*

*Maximum Marks : 100*

*Answer FIVE questions, taking ANY TWO from Group A,  
ANY TWO from Group B and ALL from Group C.*

*All parts of a question ( a,b,etc.) should  
be answered at one place.*

*Answer should be brief and to-the-point and be supplemented  
with neat sketches. Unnecessary long answers may  
result in loss of marks.*

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proper justification.*

*Figures on the right-hand side margin indicate full marks.*

**Group A**

1. (a) What are meant by 'texture' and 'fracture' of a rock ?  
Name various uses of stones in civil engineering.  
Describe desirable qualities of stones for building  
purposes. 2 x 2 + 4 + 4
- (b) What are the reasons for defects in timber ? 8
2. (a) Explain the effects of different factors which affect  
physical properties of steel. Name different market  
forms of steel available in India. 8 + 2
- (b) What are the ingredients of ordinary cement ? State  
the contributions of such ingredients. 4 + 6

3. (a) What is meant by compaction of concrete? Describe the method of machine compaction using different vibrators and state the choice of the type of vibrator for different cases. 2 + 8
- (b) Describe the method of concreting under water. What are the functions of admixtures in concrete? 6 + 4
4. (a) State the advantages of conducting non-destructive tests on concrete. Explain the properties of concrete that can be estimated from non-destructive tests on concrete. 6 + 4
- (b) Explain the characteristics of rapid hardening cement and quick setting cement. 5 + 5

**Group B**

5. (a) Explain the term 'contract'. Describe in detail the 'schedule of rate contract'. Name the components of contract document. 2 + 6 + 2
- (b) State the characteristics of first class bricks. Describe common defects of bricks. 5 + 5
6. (a) Describe the advantages of proper safety measures undertaken in a construction project. 8
- (b) What is meant by fire-resistance of a building material? Explain the common characteristics of building materials under stress. 4 + 8
7. (a) Explain the following terms: 2 + 3 + 5
- (i) Dummy activity and purpose of such activity
- (ii) Advantages of network diagram
- (iii) Total float and free float.

- (b) A construction company has an opportunity to submit a bid for construction of a building. From specifications, PERT network along with three time estimates (in weeks) are shown in Fig. 1. Determine the critical path and its standard variation. 10

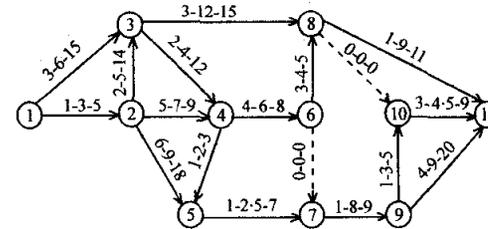


Fig. 1 Network diagram

8. (a) 30 kg of coarse aggregate was taken for sieve analysis. Weights retained on 80 mm, 40 mm, 20 mm, 10 mm, 4.75 mm sieves are respectively 0, 0, 12, 10 and 8 kg. Find the fineness modulus of the aggregate sample. The aggregate is proposed to be used in making concrete. 6
- (b) Explain slump test as per IS 1199 for measurement of workability of concrete. State the value of slump for different uses of concrete. 6 + 2
- (c) What are effects of oil contamination in mixing water on the strength of concrete? For curing of concrete, describe the type of water to be used. 3 + 3

**Group C**

9. Briefly explain the following : 10 × 2
- (i) Supplementary estimate
  - (ii) Properties of mild steel
  - (iii) Storage of cement
  - (iv) Contingencies
  - (v) Use of granite
  - (vi) Scrap and salvage value
  - (vii) All-in-aggregate
  - (viii) Limitations of bar charts
  - (ix) Segregation in concrete
  - (x) Updating.

**S'15:4FN : CV 403(1429)**

**CIVIL ENGINEERING MATERIALS AND  
CONSTRUCTION PRACTICES**

*Time : Three hours*

*Maximum Marks : 100*

*Answer FIVE questions. taking ANY TWO from Group A,  
ANY TWO from Group B and ALL from Group C.*

*All parts of a question (a, b, etc.) should  
be answered at one place.*

*Answer should be brief and to-the-point and be supplemented  
with neat sketches. Unnecessary long answers may  
result in loss of marks.*

*Any missing or wrong data may be assumed suitably giving  
proper justification.*

*Figures on the right-hand side margin indicate full marks.*

**Group A**

1. (a) Mention the qualities of good building stone. What do you mean by seasoning of timber? Briefly explain different methods of seasoning? **8**  
(b) Briefly explain the following : (i) Creep, (ii) modulus of elasticity, (iii) fatigue limit and (iv) permeability. **4 × 3**
2. (a) Explain either the wet manufacturing or dry manufacturing process of cement. Differentiate between high early strength and rapid hardening cement. **10**  
(b) Classify various types of steel. What are different properties of the structural steel? **10**

3. (a) What are important constituents of a cement concrete ?  
Briefly explain the use of admixture in concrete. 10  
(b) Briefly explain the important properties of 'hardened  
concrete' and 'fresh concrete'. 10
4. Briefly explain the following with reference to  
concrete : (i) Alkali aggregate reaction, (ii) shotcrete,  
(iii) fibre-reinforced and (iv) under-water concreting. 4 × 5

**Group B**

5. (a) Give the classification of bricks. Explain the manufac-  
turing procedure of bricks. 10  
(b) Discuss the need for standardization and standards in  
construction works. 10
6. (a) What are important types of estimates ? Also,  
explain the importance of detailed estimation in  
construction projects. 10  
(b) What do you understand by the term 'contract' ?  
Briefly explain various types of contract ? 10
7. (a) What do you understand by quality control of  
civil engineering projects ? Differentiate between  
non-destructive and destructive testing of materials. 10  
(b) What do you understand by safety issues at site for a  
construction project ? What are the standards relevant  
to safety at construction site ? 10
8. Write a short note on any *four* of the following : 4 × 5  
(a) Bar chart  
(b) CPM and PERT

- (c) Pie diagram  
(d) Depreciation and escalation  
(e) Tender document.

**Group C**

9. Briefly answer the following : 10 × 2  
(i) Characteristic strength of material  
(ii) Segregation in concrete  
(iii) Soundness test of cement  
(iv) Initial setting time of cement  
(v) Benefits of use of flyash in concrete  
(vi) Major ingredients of good brick earth  
(vii) Purpose of air entrainment in concrete  
(viii) Turnkey project  
(ix) Two limitations of bar chart  
(x) Standard and nominal size of brick as per Indian  
Standard

**W'15:4FN : CV 403 (1429)**

**CIVIL ENGINEERING MATERIALS AND  
CONSTRUCTION PRACTICES**

*Time : Three hours*

*Maximum Marks : 100*

*Answer FIVE questions, taking ANY TWO from Group A,  
ANY TWO from Group B and ALL from Group C.*

*All parts of a question (a, b, etc.) should  
be answered at one place.*

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with neat sketches. Unnecessary long answers may  
result in loss of marks.*

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proper justification.*

*Figures on the right-hand side margin indicate full marks.*

**Group A**

1. (a) What qualities you would look for a good building stone  
in masonry work ? Name the stones used in masonry  
work. 8
- (b) Define the terms (i) flexural strength, (ii) specific  
gravity, (iii) toughness index and (iv) modulus of  
elasticity. 4 × 1
- (c) Define seasoning of timber. How is seasoning done in  
large scale ? 8
2. (a) Explain various properties of mild steel and hard steel. 5
- (b) Illustrate, with neat sketches, different market forms  
of mild steel sections available in India. 5

- (c) How is initial and final setting time of cement determined in lab? What precautions should be taken while storing cement? 10
3. (a) Explain the factors affecting strength of concrete. 6  
 (b) What are superplasticizers? How are they helpful in modifying concrete properties? 8  
 (c) What are the factors affecting workability of concrete? 6
4. (a) Write short notes on the following: 5 + 5  
 (i) Ferrocement and (ii) fibre reinforced concrete.  
 (b) List various lab tests performed on concrete in fresh and hardened. Explain any two tests in detail. 5 + 5

**Group B**

5. (a) Describe briefly various tests to which bricks may be put before using them for engineering purposes? 10  
 (b) Describe the properties of first class bricks. 4  
 (c) What is efflorescence in bricks? What are its causes and remedies? 6
6. (a) List the documents included in a construction contract. 5  
 (b) Explain main features of liquidated damages and arbitration clause in a construction contract. 10  
 (c) Differentiate between PERT and CPM. 5
7. (a) Explain in brief six major functions of construction management. 6

- (b) Draw a critical path network and work out the earliest start and finish time, latest start and finish time, free float and critical path from the following data of a project: 14

Activity	Duration, days	Preceding	Succeeding
1-2	05	0	2-4 & 2-7
1-3	10	0	3-5 & 3-6
2-4	0	1-2	4-7
2-7	10	1-2	0
3-5	05	1-3	5-7
3-6	04	1-3	6-7
4-7	05	2-4	0
5-7	08	3-5	0
6-7	09	3-6	0

8. (a) Explain the following terms used in a tender document: 3 × 4  
 (i) Earnest money deposit (EMD)  
 (ii) Liquidated damages  
 (iii) Arbitration  
 (b) Suggest the safety measures to be taken during construction of a high rise building in a busy locality. 8

**Group C**

9. Briefly explain the following: 10 × 2  
 (i) Advantages of fly ash bricks  
 (ii) Bulking of sand  
 (iii) Merits of non-destructive testing

- (iv) Bleeding of concrete
- (v) Alkali-aggregate reaction
- (vi) Depreciation
- (vii) Lumpsum contract
- (viii) Optimistic time and pessimistic time estimates
- (ix) Efflorescence
- (x) Force majeure and natural disaster clause in contract

**S'16: 4 FN: CV403 (1429)**

**CIVIL ENGINEERING MATERIALS AND  
CONSTRUCTION PRACTICES**

*Time : Three hours*

*Maximum Marks : 100*

*Answer FIVE questions, taking ANY TWO from Group A,  
ANY TWO from Group B and ALL from Group C.*

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be answered at one place.*

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with neat sketches. Unnecessary long answers may  
result in loss of marks.*

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proper justification.*

*Figures on the right-hand side margin indicate full marks.*

**Group A**

1. (a) Describe various types of defects in timber caused by natural forces. 6
- (b) Briefly explain the following properties of material with reference to concrete : (i) Compressive strength, (ii) tensile strength, (iii) flexural strength and (iv) shear strength. 8
- (c) Discuss the effect of creep and volume change in concrete. 3 + 3
2. (a) What do you understand by mild steel bar and deformed steel bar ? What are different properties of structural steel ? 7

( Turn Over )

- (b) What are various oxides in portland cement? Briefly explain various chemical and mineral admixtures used in cement concrete. 7
- (c) What are different types of special concrete? Briefly explain properties of any one special concrete. 6
3. (a) Discuss different properties of good building stone? 7
- (b) Compare the properties of 'hardened concrete' and 'fresh concrete'. 7
- (c) What are various fire-resistant materials used in construction work? Describe any two fire-resistant materials used in construction. 6
4. (a) What do you mean by (i) alkali silica reaction and (ii) carbonation of concrete? 6
- (b) Write different factors which enable the segregation of concrete. 7
- (c) What are the causes of corrosion of reinforcement? Also, discuss various measures for prevention of corrosion. 7
- Group B**
5. (a) Describe various steps for manufacturing of bricks. 7
- (b) Briefly discuss the property of good bricks for construction work. 7
- (c) Briefly explain the need for standardization and standards for quality control in construction work? 6
6. (a) Define optimistic time, most likely time and pessimistic time estimate. 6
- (b) Briefly discuss the use of bar chart in project management. 7
- (c) Briefly explain the importance of estimation of construction projects. 7
7. (a) What do you mean by brick efflorescence? Discuss in brief the precaution and remedial measures for brick efflorescence. 7
- (b) What are the major differences between PERT and CPM? 6
- (c) Briefly explain the important safety issues at construction site of a major project. 7
8. (a) What are the advantages of non-destructive testing over destructive testing of materials? Briefly explain any one non-destructive testing method of concrete. 7
- (b) Write short note on tender document. 7
- (c) Differentiate between unit rate contract and lumpsum contract. 6
- Group C**
9. Briefly explain the meaning of the following: 10 × 2
- (i) Modulus of elasticity
  - (ii) Flyash
  - (iii) Permeability of concrete
  - (iv) Preliminary estimate
  - (v) Depreciation
  - (vi) Liquidated damages
  - (vii) Shotcrete
  - (viii) Cofferdam
  - (ix) Turnkey project
  - (x) Pie diagram

S16:4 FN:CV403 (1429) ( 2 )

(Continued)

S16:4 FN:CV403 (1429) ( 3 )

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**W'16:4FN : CV 403 (1429)**

**CIVIL ENGINEERING MATERIALS AND  
CONSTRUCTION PRACTICE**

*Time : Three hours*

*Maximum Marks : 100*

*Answer FIVE questions, taking ANY TWO from Group A,  
ANY TWO from Group B and ALL from Group C.*

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be answered at one place.*

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with neat sketches. Unnecessary long answers may  
result in loss of marks.*

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proper justification.*

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**Group A**

1. (a) Briefly explain the effect of environment on civil engineering material. What do you mean by the terms 'shrinkage' and 'permeability'? 10
- (b) What do you mean by high early setting cement and low alkali cement? Explain the wet processes of cement manufacturing? 10
2. (a) Classify various type of steel used for building structure. What are the different properties of rolled steel section? 10
- (b) Briefly explain the following important properties of concrete 10
- (i) Workability

( Turn Over )

- (ii) Segregation
  - (iii) Consistency
  - (iv) Water cement ratio.
3. (a) Describe important properties of plastics used in building construction. 10
- (b) Briefly explain the properties of following special concrete.
- (i) Fibre-reinforced concrete
  - (ii) Shotcrete. 10
4. (a) Describe setting and durability properties of cement. 10
- (b) What do you mean by seasoning of timber? What are the cause of the disease of dry rots in timber. 10

**Group B**

5. (a) What are the characteristics of good brick? Write also the ingredients of a good brick earth? 10
- (b) What are the international standards commonly used for construction works? 10
6. (a) Write a short note on quality control of a construction project. 10
- (b) Briefly explain the following: 10
- (i) Bar chart
  - (ii) Activity
  - (iii) Event
  - (iv) Pie Diagram.
7. (a) Briefly explain the evaluation of concrete structure by non-destructive testing? 10

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( 2 )

(Continued)

- (b) What are the various safety precautions to be kept while working at a height? 10
8. (a) Write a short notes on : 10
- (i) Tender document
  - (ii) Escalation
  - (iii) Depreciation
  - (iv) Lump sump contract.
- (b) What are the common defects in construction and their effects on strength of brick masonry. 10

**Group C**

9. Briefly explain the following: 10 × 2
- (i) Effect of carbonation in steel reinforcement
  - (ii) Creep of concrete
  - (iii) Two limitations of Bar Chart
  - (iv) Final setting time of cement
  - (v) Purpose of flyash as a admixture in concrete
  - (vi) alkali-aggregate reaction in concrete
  - (vii) Modulus of Elasticity
  - (viii) Turnkey project
  - (ix) Unit Rate contracts
  - (x) Drying Shrinkage of concrete.

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( 3 )

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**S'17:4 FN:CV 403 (1429)**

**CIVIL ENGINEERING MATERIALS AND  
CONSTRUCTION PRACTICE**

*Time : Three hours*

*Maximum Marks : 100*

*Answer FIVE questions, taking ANY TWO from Group A,  
ANY TWO from Group B and ALL from Group C.*

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with neat sketches. Unnecessary long answers may  
result in loss of marks.*

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proper justification.*

*Figures on the right-hand side margin indicate full marks.*

**Group A**

1. (a) For durable and cost effective construction with stones, name the properties of stones to be ensured. Briefly describe the test procedure for finding compressive strength of building stone. Indicate methods to protect stones from deterioration. 4 + 6 +3
- (b) What is meant by setting time for cement? Explain the effects of different factors on setting time. Name the apparatus used for finding setting time as per I.S. Code. 3 + 3 + 1
2. (a) Name the different market forms of steel available in India. State the characteristics of steel to be used in reinforced concrete and prestressed concrete. 3 + 5

*( Turn Over )*

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