

KATHMANDU UNIVERSITY  
End Semester Examination  
February/March, 2025

Marks Scored:

Level : B.Tech.

Year : II

Exam Roll No. :

Registration No.:

02 MAR 2025

Time: 30 mins.

Course : CIEG 201

Semester : II

F. M. : 10

Date

02 MAR 2025

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Select the encircle the most appropriate answer.

1. A material can be beaten rolled into plate due to its property of  
a. Malleability      b. Elasticity      c. Ductility      d. Plasticity
2. The main ingredient of a good quality brick earth is  
a. Magnesia      b. Lime      c. Silica      d. Alumina
3. Age of a tree may be ascertained by  
a. Radius of its stem      b. Number of branches  
c. Circumference of its stem      d. Number of annual rings
4. What is the purest form of iron?  
a. Cast Iron      b. Wrought Iron      c. Pig Iron      d. Steel
5. Air seasoning of timber is done up to  
a. 1 year      b. 2 year      c. 2-4 year      d. 2-3 year
6. Excess of alumina in brick earth makes the brick  
a. Impermeable      b. Brittle and weak  
c. To lose Cohesion      d. To Shrink and warp on drying
7. Which one is not a correct statement?  
a. Tar is a toxic compound  
b. Bitumen is the purest form of asphalt  
c. Bitumen cannot be used as paints  
d. Destructive distillation of coal leads to formation of tar
8. The standard size of brick available in Nepal according to Nepal Building Code (NBC) in mm is  
a. 230\*115\*57      b. 230\*110\*75      c. 240\*115\*55      d. 270\*110\*55
9. Most suitable aggregates to be used in construction process is  
a. Flaky aggregates      b. Elongated aggregates  
c. Irregular aggregates      d. Angular aggregates
10. The compressive strength of 100mm cube as compared to 150mm cube is always  
a. Less      b. More      c. Equal      d. Less or Equal

11. The ratio of cement, sand and aggregate in nominal M20 concrete mix is  
a. 1:2:4                      b. 1:1.5:3                      c. 1:1:2                      d. 1:3:6
12. An aggregate having all the pores filled with water but having dry surfaces is called  
a. Saturated surface dry aggregate                      b. Dry aggregate  
c. Moist aggregate                      d. Surface dried aggregates
13. The process of mixing, transporting, placing and compacting concrete using ordinary Portland cement should not take more than  
a. 30 minutes                      b. 40 minutes                      c. 60 minutes                      d. 75 minutes
14. Strength of concrete increases with  
a. Increase in water cement ratio                      b. Decrease in curing time  
c. Increase in curing time                      d. Increase in fineness of cement
15. Workable concrete for beam and slab is obtained with allowable slump  
a. 20-30 mm                      b. 12-25 mm                      c. 50-100 mm                      d. 75-150 mm
16. Le-chatelier apparatus is used to perform  
a. Soundness test                      b. Fineness test  
c. Consistency test                      d. Compressive Strength test
17. Volume of coarse aggregate required to make 100 cu.m. of 1:2:4 cement concrete is  
a.  $88\text{m}^3$                       b.  $90\text{m}^3$                       c.  $78\text{m}^3$                       d.  $60\text{m}^3$
18. Splitting tensile test of concrete is done by  
a. Direct tension test in UTM  
b. Applying third point loading on a prism  
c. Applying compressive load along the diameter of cylinder  
d. Applying tensile load along the diameter of the diameter of the cylinder
19. Which Bouge's compound has highest heat of evolution  
a. Dicalcium Silicate                      b. Tricalcium Silicate  
c. Tricalcium Aluminate                      d. Tetracalcium alumina ferrite
20. The range of particle of fine aggregate is  
a. 0.075mm to 4.75mm                      b. 0.06mm to 4.75mm  
c. 0.02mm to 8.75mm                      d. 0.06mm to 8.75mm

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Semester : II  
F.M. : 40

SECTION "B"

Attempt *ALL* questions.

1. What is Abel's process? How do you increase the durability of construction materials, if the condition of a material is given such a way that, i) the timber is well seasoned?  
ii) Timber containing 200% of moisture of the well-seasoned timber. [1+3]
2. Why is zinc used in galvanization of steel instead of copper? Explain with chemical reaction. Describe the role of heat treatment in improving the mechanical properties of metals. [1.5+3.5]
3. Describe the constituents of bricks in brief. Explain the different types of bonds used in brick masonry. [2.5+2.5]
4. Describe about the Alkali-silicate reaction. Explain the method of manufacturing of cement for ordinary Portland cement. What is the role of admixture in concrete? [1.5+3+1.5]
5. Define Hydration of cement with chemical reactions. Explain the different laboratory test of cement. [1+4]
6. Define Abram's law. How the strength of concrete is affected by physical and mechanical properties of aggregate? Explain in detail [1+3]
7. Write short notes on (*ANY TWO*) [2×2.5=5]
  - a. Curing of concrete
  - b. Stress-strain diagram for a mild steel under tensile test
  - c. Calorimetric curve of Portland cement
  - d. Forms of Bitumen

**P.T.O.**

8. Using I.S method, design a concrete mix for reinforced concrete structure using ordinary Portland cement of grade 53 with the characteristic compressive strength of a concrete required in field at 28days is 40Mpa, if the superplasticizer is used as chemical admixture.

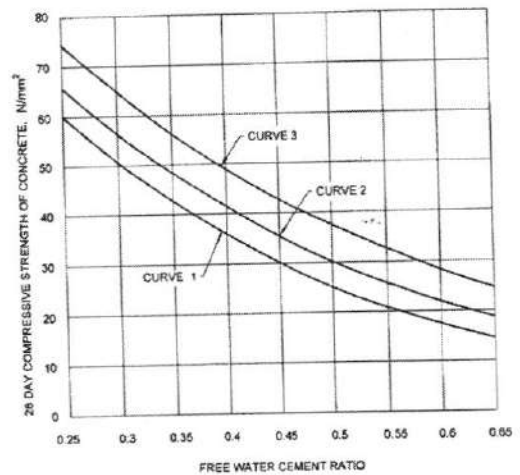
- Fine aggregate zone-II,
- Standard deviation=5 and X=6.5
- Design mix target slump=100mm
- Maximum nominal size of aggregates=20mm(SSD condition)
- Type of aggregate=Crushed angular aggregates
- Exposure condition=Severe
- Degree of supervision=Good
- Sp.gravity of fine aggregate=2.65
- Sp.gravity of Coarse aggregate=2.82
- Sp.gravity of cement=2.93
- Sp.gravity of admixture=1.21
- Water absorption of Coarse aggregate and fine aggregate = 0.5% and 1% respectively.
- Missing data, if any can be assumed accordingly

[6]

**Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size**

(Clauses 6.1.2, 8.2.4.1 and 9.1.2)

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m <sup>3</sup>	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m <sup>3</sup>	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
i)	Mild	220	0.60	M 15	300	0.55	M 20
ii)	Moderate	240	0.60	M 20	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40



**Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate**

(Clause 5.3)

Sl No.	Nominal Maximum Size of Aggregate mm	Water Content <sup>1)</sup> kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

**Table 5 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate for Water-Cement/Water-Cementitious Materials Ratio of 0.50**

(Clause 5.5)

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.54	0.52	0.50	0.48
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.73	0.72	0.71	0.69