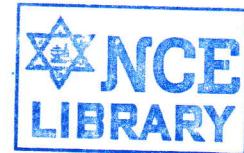


TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

| | | | |
|--------------------|-------------|-------------------|--------|
| Exam. | Back | | |
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE 603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ IS 1905-1987 and NBC 109-1994 are allowed to use.
- ✓ Assume suitable data if necessary.



1. a) Define sphericity. Give example and state the effect of particles with higher sphericity value. Describe the process of determining aggregate crushing value in the laboratory. [3+3]
- b) Explain different rapid field testing method for cement. What do you think is the basic difference between i) setting and hardening ii) initial and final setting time iii) admixture and additives? [3+3]
- c) Explain series and parallel phase model of mortar, interface and coarse aggregate of concrete during load transfer. Write in short about solids present in hydrated cement phase. [3+3]
2. a) How does shape and size of aggregate affect workability? Define segregation and its two forms. Explain with suitable figure the control of segregation during discharge of fresh concrete from hopper and during placing of fresh concrete in deep wall? [2+4]
- b) Describe stepwise process of mix design of concrete by IS method. Show sample table and graph wherever possible. [7]
- c) Define shrinkage and its types. Explain with strain-time graph, creep, instantaneous recovery and creep recovery of concrete. [3+3]
3. a) Explain splitting method of test for tensile strength of concrete. What is the advantage of such test? Write the precautions that should be taken while performing Schmidt hammer test of concrete. [3+3]
- b) Permeability of concrete is often referred as the root cause for lack of durability" Do you agree with the statement? Explain. Also show the schematic representation of the material having similar porosity but different (low or high) permeability. [3+3]
4. a) Define the following terms used in brick construction technology: Arrises, Perpends and Lap. What is equivalent strut behavior of infill wall? Is it advantageous? Draw a plan of one and half brick thick wall with English bond. [3+3+3]
- b) Determine the allowable axial load on column 30cm x 60cm constructed with brick in cement mortar using 200x100x100 mm brick. The height of the column is 3.2m. The roof consists of RCC beam and slab. [7]
5. a) Design an exterior wall of a single storey warehouse of 3.5m height. The loading on wall consists of vertical load of 25KN/m from the roof and wind pressure of 860 KN/m². The wall is fixed at base and tied with metal anchor at the roof level. [8]
- b) What are the causes of out of plane failure of masonry? Give any two example of effects (crack pattern) seen in masonry structure due to this type of failure. Explain push shear test of masonry. [5+3]

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

| Exam. | Regular | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE 603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ IS 1905-1987 and NBC 109-1994 are allowed to use.
- ✓ Assume suitable data if necessary.



1. a) What is bulking of aggregate? How can its effect controlled during manufacture of concrete? [6]
- b) Describe concrete as three phase system and explain the structure of hep in concrete. [6]
- c) Briefly explain the Bogue's compound of cement. [4]
2. a) Explain the steps of concrete mix design based on DoE Method used in concrete. [8]
- b) During concreting, how would you maintain the quality control in site? [4]
- c) List out the properties of hardened concrete. Describe the elastic behavior of harden concrete. [4]
3. a) Calculate the compressive strength of cement, when 300 gm of cement is mixed with 150 gm of water. Consider: Case I- Cement is fully hydrated, Case II- 60% of Cement is hydrated. [6]
- b) Explain the procedures of compressive strength test of concrete. What are the acceptance criteria of test results? [4+2]
- c) Explain on uses and advantages of Hollow Blocks and Compressed Earth Blocks. [4]
4. a) A wall 20 cm thick, using modular bricks carries at the top a load of 100 kN/m having resultant eccentricity of 1/12. Wall is 5 m long between cross wall and is of 3.4 m clear height between RCC slabs at top and bottom. What should be the required strength of brick and grade of mortar? Assume that joints are not raked. [10]
- b) Explain various types of Brick bonds with neat sketches. What are the advantages and disadvantages of Rat Trap Bond in masonry structure? [6]
5. a) A column section 400 mm × 800 mm carries load 250 kN acting at 160 mm from the 800 mm face and 350 mm from the 400 mm face. Determine the stress intensities at all four corners. [8]
- b) Explain the procedure to test brick masonry prism in laboratory. [6]
- c) Explain lateral load resisting system of masonry structures. [2]

TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2078 Bhadra

| Exam. | Regular | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE 603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ IS 1905-1987 and NBC 109-1994 are allowed to use.
- ✓ Assume suitable data if necessary.

1. a) Define nominal size, single size and maximum sizes of aggregate with example. Why is grading of aggregate important with regard to the properties of concrete? [6]
- b) Describe concrete as three phase system. [6]
- c) Discuss about the compressive strength test on the brick wall. [4]
2. a) Explain the steps of concrete mix design based on DOE Method used in concrete. [8]
- b) What are the measures of workability? What is the role of water cement ratio to the workability, strength and durability of concrete? [4]
- c) Describe dynamic and static modulus of elasticity of concrete. [4]
3. a) Explain various strength of concrete. [4]
- b) You are site in charge for quality control of concrete at site and discuss the steps you follow to maintain the quality of concrete. Also elaborate the non-destructive test by rebound hammer. [2+4]
- c) Discuss the relation between water and permeability on concrete durability. Write the corrosion on steel and its remedial measure. [6]
4. a) A 23 cm thick brick Masonry wall carries an axial load of 12 Kn per meter length and eccentric load 27Kn per meter length acting at distance 7.33 cm from the axis of wall. Design the masonry wall if its slenderness ratio 16, assume that joints are non-raked. [8]
- b) Find the minimum strength of masonry unit and mortar type for a column 200 mm × 400 mm size to support 120 KN load with an eccentricity of 50 mm. The clear height of the column is 3m and fully restrained at both ends. [8]
5. a) Describe the scope of masonry structures. [2]
- b) Explain with figure, failure behavior of masonry structures in lateral loads. What is in-plane and out of plane behavior of masonry structure. [5+3]
- c) Explain flat jack test and push shear test in masonry with figure. [3+3]

TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2078 Kartik

| Exam. | | Back | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE 603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ IS 1905: 1987 is allowed.
- ✓ Assume suitable data if necessary.



1. a) Write down the properties of aggregates for concrete. How do the aggregate properties influence the concrete properties? [4+4]
- b) Describe three phase system of concrete. Explain the role of aggregate phase. [4+2]
2. a) Describe the ways of determining the workability of a concrete mix in lab. [6]
- b) Explain the process of concrete mix design based on ACI Method. [8]
3. a) Explain shrinkage and creep in concrete. [4+4]
- b) Explain the variability of concrete strength and acceptance criteria. [6]
- c) Write down the physical and chemical causes of concrete deterioration. [6]
4. a) Explain the main elements that resist the lateral loads in buildings. Explain with sketches. [8]
- b) External wall of a single storeyed building is 23 cm thick and carries 100 kN/m load at the top of the wall with the eccentricity of 12 mm. The plinth level is 1.5 m above the top of foundation footing and floor to ceiling height is 3.0 m. RCC slab bears on the wall and is 12 cm thick. Determine the maximum stress in the wall and calculate the strength of brick and grade of mortar required for the wall. Assume necessary data if any required. [12]
5. a) A column section 400 mm × 800 mm carries load 250 kN acting at 160 mm from the 800 mm face and 350 mm from the 400 mm face. Determine the stress intensities at all four corners. [6]
- b) Explain nondestructive tests in masonry. [6]

TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2076 Chaitra

| Exam. | Regular | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE 603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ IS 1905-1987 and NBC109-1994 are allowed to use.
- ✓ Assume suitable data if necessary.

1. a) Describe the use of concrete in structure. How does fineness modulus of aggregate impact? [4+2]
- b) What do you know about 3 phases of concrete? Explain the effect of transition zone on concrete properties. [2+2]
- c) Describe the NDT test for Masonry Structure. [6]
2. a) Describe the stepwise process of mixed-design of concrete by ACI method. [8]
- b) Explain segregation and bleeding along with their causes. [4]
- c) Explain the properties of hardened concrete. [4]
3. a) What are the acceptance criteria while testing of concrete? [4]
- b) Explain the methods of non-destructive testing of concrete. [4]
- c) Explain chemical causes of concrete deterioration. [6]
4. a) Explain various factors to be considered in design of masonry. [4]
- b) A wall 230 mm thick, using local bricks carries 135 kN/m load at top of wall having eccentricity ratio of 1/12. Wall is 4m long between cross walls and is 3m clear height between RCC slab at bottom and timber flooring top. What shall be the strength of brick and grade of mortar? Assume necessary data if any required. [12]
5. a) Describe types of bond use in masonry construction. How does strength of masonry unit and grade of mortart affect the capacity of a masonry? [4+4]
- b) Describe in plane and out plane behavior of masonry structure with sketches. How do you improve the seismicity performance of the structure? Draw the elements that resist lateral loads in masonry wall in load bearing building? [2+2+4]



TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

| Exam. | Back | | |
|-------------|-------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III/I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE 603)

✓ Candidates are required to give their answers in their own words as far as practicable.

✓ Attempt All questions.

✓ The figures in the margin indicate Full Marks.

✓ If any Allowed codes / Necessary chart specify IS code 1905-1987.

✓ Assume suitable data if necessary.

1. a) State briefly four mechanical properties of aggregate. Explain bulking of sand. [4+2]
- b) Describe concrete as three phase system and explain the structure of hcp in concrete. [6]
2. a) Design a concrete mix using ACI method. The specified strength of concrete is 25MPa at 28 days. The specific gravity of FA and CA are 2.6 and 2.7 respectively. Use standard deviation as 4 MPa. The dry rodded bulk density of CA is 1650 kg/m³ and fineness modulus of FA is 2.8. Approximate air entrapped is 2%. Assume suitable data if required. [8]
- b) How would you maintain the quality control in site? [4]
3. a) Explain Maturity of concrete. Define shrinkage and creep of concrete. [6]
- b) Explain chemical causes of concrete deterioration. [6]
4. a) Explain Rebound Hammer test and Ultrasonic Pulse Velocity test. [6]
- b) Calculate the splitting tensile strength of concrete cylinder (300mm × 150mm dia) and cube (150mm×150mm×150mm) under standard splitting test, if the load shows by testing machine is 500KN. [6]
5. a) What are the uses of masonry structures? Explain with neat sketches. [6]
- b) Explain the in-plane and out-of-plane behaviour of masonry structures. [6]
6. a) Design an interior cross wall of a three storied building to carry 150mm thick RCC slab with ceiling height of 3.5m. [12]

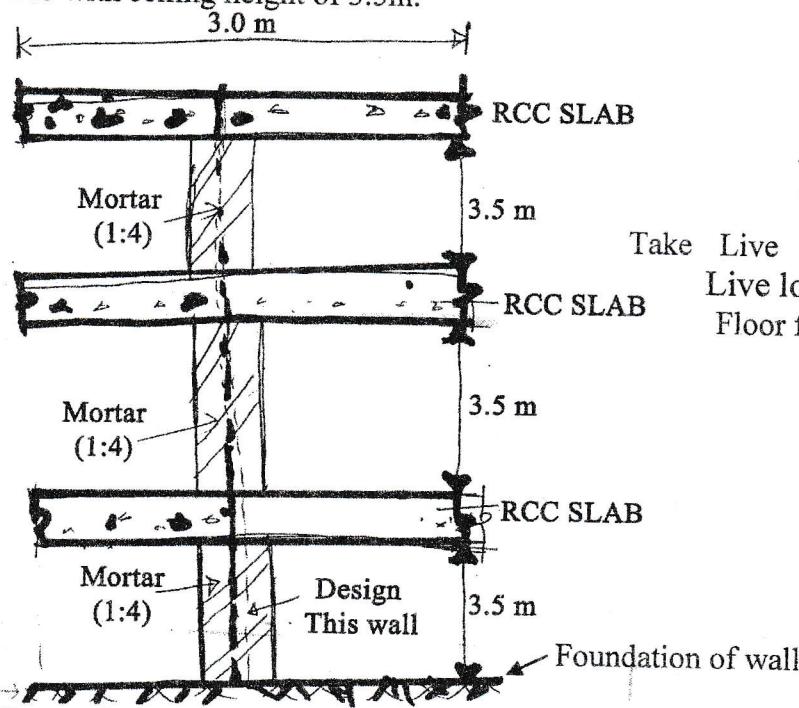


Figure: Cross Section along interior wall

- b) A column section 400mm × 800 mm carries load 250 KN acting at 160mm from the 800 mm face and 350 mm from the 400 mm face. Determine the stress intensities at all four corners.

[8]



TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

| Exam. | Regular / Back | | |
|-------------|----------------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE 603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Necessary charts are attached herewith.
- ✓ IS 1905:1987 is allowed code.
- ✓ Assume suitable data if necessary.

1. a) Define structural concrete. List out the different types of concrete used in civil engineering construction. [2+4]
 - b) Explain concrete as three phase system. Explain in brief, the transition zone effect in concrete properties.
 2. a) Define the concrete mix design of concrete. Describe the steps of Design mix of concrete by DOE method. [4+2]
 - b) Explain quality control in site in different phase of construction. [2+6]
 3. a) Describe the various strength tests on cement concrete. [4]
 - b) Describe the elastic properties and the Modulus of elasticity of concrete. [6]
 4. a) Explain the non-destructive testing technique on concrete works. [6]
 - b) Explain physical causes of concrete deterioration. [6]
 5. a) What are the main elements that resist the lateral load? Explain with sketches. [6]
 - b) Explain with neat sketches, Flat-jack test and push-shear test. [6]
 6. a) A wall 230mm thick, using modular bricks carries at the top a load of 100kN/m having resultant eccentricity ratio of 1/12. Wall is 5m long between cross walls and is 3.5m clear height between RCC slabs at the top and bottom. What shall be the strength of brick and the grade of mortar? Assume that joints are not raked. [3+3]
 - b) Column section 500m x 900m carries a load 300 kN acting at 170 mm from the 900 mm face and 360 mm from the 500 mm face. Determine the stresses intensities at all four corners. [12]
- [8]

| Compressive strength at 28 days, MPa* | Water-cement ratio, by mass | |
|--|-------------------------------|---------------------------|
| | Non-air-entrained concrete | Air-entrained concrete |
| 40 | 0.42 | 0.39 |
| 35 | 0.47 | 0.45 |
| 30 | 0.54 | 0.52 |
| 25 | 0.61 | 0.60 |
| 20 | 0.69 | 0.69 |
| 15 | 0.79 | 0.70 |

Water, Kg/m³ of concrete for indicated nominal maximum sizes of aggregate

| Slump, mm | 9.5* | 12.5* | 19* | 25* | 37.5* | 50†* | 75‡ | 150‡ |
|---|------|-------|-----|-----|-------|------|-----|------|
| Non-air-entrained concrete | | | | | | | | |
| 25 to 50 | 207 | 199 | 149 | 179 | 166 | 154 | 139 | 113 |
| 75 to 100 | 223 | 216 | 205 | 193 | 181 | 169 | 145 | 124 |
| 150 to 175 | 243 | 228 | 216 | 202 | 190 | 178 | 160 | — |
| Approximate amount of entrapped air in non-air-entrained concrete, percent | 3 | 2.5 | 2 | 1.5 | 1 | 0.5 | 0.3 | 0.2 |
| Air-entrained concrete | | | | | | | | |
| 25 to 50 | 181 | 175 | 168 | 160 | 150 | 142 | 122 | 107 |
| 75 to 100 | 202 | 193 | 184 | 175 | 165 | 157 | 133 | 119 |
| 150 to 175 | 216 | 205 | 197 | 184 | 174 | 168 | 154 | — |

Recommended average total air content, percent for level of exposure:

| Mild exposure | 4.5 | Moderate exposure | 6.0 | Extreme exposure‡‡ | 7.5 |
|---------------|-----|-------------------|-----|--------------------|-----|
| | 4.0 | 5.5 | 6.0 | 5.0 | 6.0 |
| | 3.5 | 5.0 | 6.0 | 4.5 | 5.5 |

| Types of construction | Slump, mm | | Nominal maximum size of aggregate, mm | Volume of dry-packed coarse aggregate, per unit volume of concrete for different fineness moduli of fine aggregate |
|---|-----------|---------|--|--|
| | Maximum* | Minimum | | |
| Reinforced foundation walls and footings | 75 | 25 | 9.5 | 2.40 |
| Plain footings, caissons, and substructure walls | 75 | 25 | 12.5 | 0.50 |
| Beams and reinforced walls | 100 | 25 | 19 | 0.59 |
| Building columns | 100 | 25 | 25 | 0.66 |
| Pavements and slabs | 75 | 25 | 37.5 | 0.71 |
| Mass concrete | 75 | 25 | 50 | 0.75 |
| | | | 75 | 0.78 |
| | | | 75 | 0.82 |
| | | | 75 | 0.80 |
| | | | 150 | 0.87 |
| | | | 150 | 0.85 |
| | | | 150 | 0.83 |
| | | | 150 | 0.81 |

| Exam. | Back | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ IS Code 1905-1987 is allowed.
- ✓ Assume suitable data if necessary.

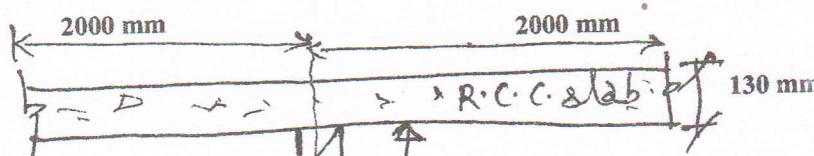
1. a) Explain the basic requirement of coarse and fine aggregates in concrete which is to be used in construction field. Why need to grading of aggregate? [4+2]
- b) Describe concrete as three phase system and also explain the effects of hcp structure in the concrete properties. [2+4]
- c) Define workability. List the factors that affect the workability of the concrete. [1+2]
2. a) What is the nominal mix of concrete design? How it is used in field? [3+2]
- b) What are the key concepts of ACI method of concrete mix proportioning? Explain with suitable example. [8]
3. a) Explain how height/diameter ratio of cylindrical test specimen affect the relative compressive strength of concrete? How can you determine tensile strength of concrete using splitting tension test method, Explain in brief? [2+4]
- b) Write about physical and chemical causes of concrete deterioration. What are the effects of corrosion of steel in concrete? [4+3]
4. a) What is the use of non-destructive test (NDT) on civil engineering field? List out the non-destructive test methods in brief. [2+4]
- b) Describe the mechanical and physical causes of concrete deterioration. [4+3]
5. a) Explain the importance of masonry structure as load bearing element in context of Nepal. [3]
- b) Design an interior cross wall of two storeyed building to carry 120 mm thick RCC slab with ceiling height of 3.0m. The wall is unstiffened and supports a 2.5m wide slab on both sides. Assume suitable data if required,
 Live Load on roof = 1.50 KN/m²
 Live Load on Floor = 2.0 KN/m²
 Wt. of 60mm screed including finishing = 1.2 KN/m² [10]
6. a) What are the in-plane and out-of-plane behavior of masonry structures? Describe in detail with necessary sketches. [3+3]
- b) List out the non-destructive testing technique on brick masonry wall. [3]
- c) Explain with neat sketches, Elastic wave tomography test and push shear test for masonry structures. [2+2]

| Exam. | | Regular | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ IS Code 1905-1987 is allowed.
- ✓ Assume suitable data if necessary.

1. a) What is soundness of aggregates? How it is measured in Laboratory? [2+3]
- b) Explain the concrete as three phase system with necessary sketches. Describe the structure of the hcp phase. [3+2]
- c) Describe the different types of admixtures used in concreting works at site. [5]
2. a) Describe stepwise procedure for ix design of concrete by DOE method. [7]
- b) Explain properties of hardened concrete. [6]
3. a) What is work ability of concrete? Describe in details different methods to measure work ability of concrete during concreting work at construction site. [2+3]
- b) Explain the maturity of concrete with suitable example. [4]
- c) What are the destructive tests (DT) of concrete? [4]
4. a) Describe the importance of Non-destructive testing of concrete. Explain Schmidt hammer test. [3+4]
- b) Explain the physical causes of concrete deterioration. [6]
5. a) Design an interior cross-wall of a two - storeyed building to carry 130 mm thick RCC slab with ceiling height of 2.8 m and the wall is 3.2 m long which is stiffened and supports 2m slab on both sides as shown in figure below. [9]



Assume all necessary data relevant to Nepal code.

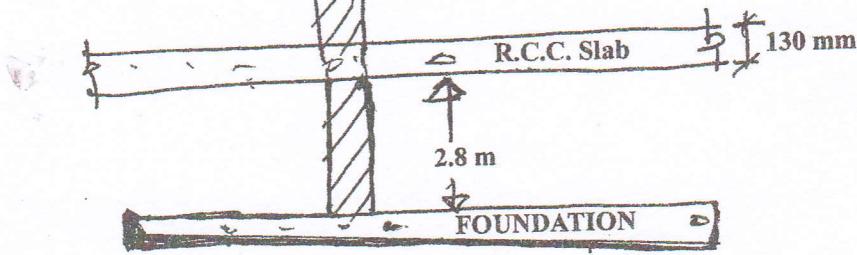


Fig: Cross Section of Wall

6. b) Describe the role of brick masonry infill walls with neat sketches. [4]
6. a) Describe the In-plane and Out of Plane behavior of masonry structures. Explain ductile behavior of reinforced and unreinforced masonry structure. [2+4]
6. b) List the elements of masonry structure resisting lateral loads. Describe the stepwise

06 TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2074 Ashwin

| Exam. | | Back | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.
- ✓ Use of IS: 1905-1987 is allowed to design Masonry Structure.

1. a) Explain in brief about Bogue's compound of cement. List the types of admixtures used in concreting works and explain the purpose of using admixtures. [2+2+2]
- b) What do you understand by transition phase of concrete? Explain the effect of transition phase in the properties of concrete. [3+3]
2. a) Explain ACI method of concrete mix design. [8]
- b) Define workability and Write down the procedure for performing slump test. [1+3]
3. a) Explain elastic deformation, shrinkage and creep in concrete. [2+2+2]
- b) Explain methods for performing flexural test of concrete. [6]
- c) How is Ultrasonic Pulse Velocity test carried out? How do you interpret the results obtained from the test with the quality of concrete? [4+2]
4. a) Describe chemical causes of concrete deterioration. [6]
- b) What do you understand by masonry structure? State its structural limitations. Explain English and Flemish bond. [2+4]
5. A brick wall 23 cm thick using modular brick carried eccentric load of 165 KN/m at base (eccentricity ratio at 1/12). The wall is 4.5 m long between cross walls. The clear height of wall is 3.1 m between RCC slabs of 10 cm thick at top and bottom. What should be the strength of brick and Grade of mortar? Assume that joints are not raked. [12]
6. a) Describe In-plane and out of plane behaviour of masonry structure. What are the elements that resist lateral loads in masonry system. [6+2]
- b) Explain Compressive and Diagonal Shear Tests in masonry structures? [3+3]

| Exam. | New Back (2066 & Later Batch) | | |
|-------------|-------------------------------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Define mechanical properties of aggregate. How do you rank the aggregate grading in lab? [4]
- b) Explain concrete as three phase materials and describe transition zone in detail. [6]
- c) Describe creep and shrinkage phenomenon for hardened concrete. [6]
2. a) How do you assure the quality control of concrete at site? Explain slump test in detail. [6]
- b) Differentiate Nominal and design mix. Describe the stepwise process of mix-design of concrete by ACI method. [2+8]
3. a) What is modulus of rupture of concrete? How do you determine it in laboratory? [2+4]
- b) Describe the importance of non-destructive tests in concrete and its uses in civil engineering infrastructures. [6]
- c) What are the standard process adopted on each process of concrete production. [4]
4. a) Explain the use of different types of closer in brick masonry works. Describe the key points of English bond and Flemish bond. [6]
- b) Design an interior Cross wall of a two-storeyed building to carry 125 mm thick RCC slab with 3.2 m ceiling height. The wall is unstiffened and supports a 2.5 m wide slab on both sides. [10]

Live load on roof = 1.5 KN/m²
 Live load on floor = 2.0 KN/m²
 Floor finishing = 1.2 KN/m²
5. a) A column section 400 mm × 800 mm carries load 250 kN acting at 160 mm from the 800 mm face and 350 mm from the 400 mm face. Determine the stress intensities at all four corners. [10]
- b) Describe the diagonal shear test for masonry wall. [6]

| Exam. | Regular | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Define grade of cement. Explain the role of Bouge's compound of cement. [4]
- b) List out common admixture available in market. Elaborate in brief the accelerating admixture. [6]
- c) Explain the three phases of concrete and their role in concrete strength. [6]
2. a) Design the mix proportion for concrete with help of the following given data:
 Design parameters:
 Concrete grade: M 25
 Max size of aggregate: 25 mm
 Specific gravity of C.A: 2.7
 Specific gravity of F.A: 2.6
 Degree of expose: Moderate
 Fineness modulus of F.A: 3.00
 Method of design: DOE method
 Based on obtained your mix ratio, calculate the quantity of ingredients of concrete for 2 m³ concrete production. (Assume all necessary relevant data)
 b) Describe the elastic properties of concrete. [6]
3. a) Why non-destructive test is important in concrete structures and list out the NDT methods.
 b) Explain in brief chemical causes of concrete deterioration. [4]
 c) Explain fatigue and impact strength of concrete. [6]
4. a) Define the Reinforced and unreinforced masonry structure. Explain with neat sketch Rat-trap bond and mention its advantages.
 b) A wall 230 mm thick, using modular bricks carries at the top a load of 100 kN/m having resultant eccentricity ratio of 1/12. Wall is 5 m long between cross walls and is 3.5 m clear height between RCC slabs at the top and bottom. What shall be the strength of brick and the grade of mortar? Assume that joints are not ranked. [10]
5. a) Explain the effect of lateral loads on masonry wall with and without opening in wall.
 b) Describe the diagonal shear test for wall.
 c) List the name of destructive tests and non-destructive (NDT) tests in masonry wall. [4]

| | | | |
|--------------------|-------------------------------|-------------------|--------|
| Exam. | New Back (2066 & Later Batch) | | |
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.
- ✓ Code IS 1905-1987 is allowed.

1. a) Describe Mechanical properties of Aggregates. [6]
- b) Explain concrete as three phase system and explain Binding medium phase in detail. [6]
2. a) Design the mix proportion for concrete with help of the following particulars using IS method:
 Design parameters:
 Characteristic strength $f_{ck} = 30 \text{ N/mm}^2$
 Max size of aggregate = 20 mm
 Shape of CA = Angular
 Degree of workability = 0.85
 Degree of quality control = Fair
 Degree of exposure = Severe
 (Assume all necessary relevant data)
- b) How do you assure the quality control of concrete at site? [4]
- c) Describe creep and shrinkage phenomenon for hardened concrete. [6]
3. a) How do you determine modulus of rupture of concrete specimen in Lap? Explain. [6]
- b) Explain non-destructive testing process of concrete and explain its importance. [6]
- c) What are the effects of carbonation and permeability on concrete durability? [6]
4. a) Explain the use of Masonry structure. Describe the types of bond of brick masonry with neat sketches. [6]
- b) A wall 230 mm thick, using modular bricks carries at the top a load of 100 kN/m having resultant eccentricity ratio of 1/12. Wall is 5 m long between cross walls and is 3.5 m clear height between RCC slabs at the top and bottom. What shall be the strength of brick and the grade of mortar? [12]
5. a) Explain design process for a masonry wall under lateral loadings. [8]
- b) Describe the diagonal shear test for masonry wall. [6]

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 INSTITUTE OF ENGINEERING
Examination Control Division
 2071 Chaitra

| Exam. | Regular | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.
- ✓ Code IS 1905-1987 is allowed.

1. a) Explain concrete ingredients and concrete as structural materials over steel. [6]
- b) Describe concrete as three phase system and explain the effects of Transition zone in the properties of concrete. [6]
2. a) Describe the stepwise process of the mix design of concrete by DOE method. [8]
- b) What are the effects of hot weather on concreting and also explain the precautionary measures to take for concreting in hot weather? [4]
- c) Explain effect of gel/space ratio in theoretical strength of concrete. [6]
3. a) Explain tests to estimate strength of concrete in compression and tension. [6]
- b) What is the importance of Non-destructive tests for concrete structure? Explain. [6]
- c) Explain the physical and chemical causes of concrete deterioration. List out effect of corrosion of steel in concrete. [6]
4. a) Design an exterior wall of a single storey warehouse of 3.5 m height. The loading on the wall consists of vertical load of 25 KN/m from the roof and wind pressure of 860 N/m². The wall is tied with metal anchor at the floor and roof level. [12]
- b) A column section 400 mm × 800 mm carries load 250 kN acting at 160 mm from the 800 mm face and 350 mm from the 400 mm face. Determine the stress intensities at all four corners. [8]
5. a) Explain use of masonry structures as load bearing and non-load bearing walls. [6]
- b) Describe the flat jack test for brick masonry wall with neat sketch set up. [6]

| | | | |
|-------------|-------------------------------|------------|--------|
| Exam. | New Back (2066 & Later Batch) | | |
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Define admixtures. What is the role of admixtures in concrete? Explain the use of superplasticizer in concrete. [2+4]
- b) Explain in details the necessity of three phase system of concrete. [6]
- c) What do you understand by workability of concrete? How do you measure the workability of concrete? [4]
2. a) Describe the conceptual steps of concrete mix design based on IS method. [4]
- b) Explain the types of slumps. How you measure slumps in concretes. [4]
- c) Calculate the gel/space ratio and the theoretical strength of a sample concrete made with 600 gm of cement with 0.45 water/cement ratio, on full hydration and at 60 percentage hydration. [4]
- d) What is fatigue effect in concrete? [2]
3. a) Explain the importance of Non-destructing testing of concrete in civil engineering structures. [6]
- b) How do you determine the compressive strength of concrete using Ultrasonic pulse Velocity method? [6]
- c) What are the physical and chemical causes of concrete deterioration? [6]
4. a) Explain with neat sketches English bond and Flemish bond of brick masonry work. [6]
- b) A wall 230mm thick, using modular bricks carries at the top a load of 100kN/m having resultant eccentricity ratio of 1/12. Wall is 5m long between cross walls and is 3.5 m clear height between RCC slabs at the top and bottom. What shall be the strength of brick and the grade of mortar? [12]
5. a) Describe about compression test and diagonal shear test of masonry wall. What is the basic difference between these two tests? [6]
- b) Describe in details with necessary sketches in plane and out of plane behavior of masonry structures. [8]

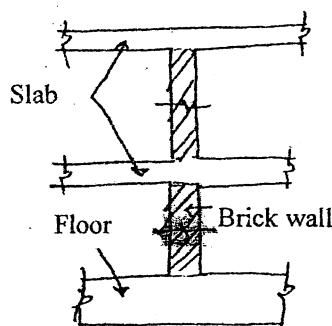
| Exam. | | Regular | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) What are the ingredients of olden age concrete and modern age concrete? Explain use of concrete as structural materials. [4]
- b) What are the effects of the shape and texture of aggregates on the strength and workability of concrete? [2]
- c) Describe concrete as three phase system and explain the effects of Transition zone in the properties of concrete. [6]
2. a) Design the mix proportion for concrete with the help of following particulars using American Concrete Institute (ACI) method:
 Characteristics compressive strength, $f_{ck} = 30 \text{ Mpa}$
 Water cement ratio based on the compressive strength = 0.48
 Assume all necessary data. [8]
- b) What are the effects of cold weather concreting and also explain the precautionary measures to take for concreting in cold weather? [4]
- c) What is the young's modulus of elasticity of concrete? [3]
- d) Describe shortly the creep and shrinkage. [2]
3. a) Describe in details, tensile strength tests of concrete. [3]
- b) Calculate the modulus of rupture of the concrete beam under single and two point loading for following data: Size of beam = 150mm×150mm, length of beam = 750 mm. Failure loads for single point loading is 100KN and two point loadings each of 50KN. [4]
- c) Explain, in brief, physical and chemical causes of concrete deterioration. [6]
- d) Write down the acceptance criteria of compressive and flexural strength according to IS456-2000. [4]
4. a) Explain the use of Masonry structure. Describe the types of bond of brick masonry with neat sketches. [6]
- b) Design an interior cross wall of a two storeyed building to carry 120 mm thick RCC slab with 3.0 m ceiling height. The wall is unstiffened and supports a 3.0 m wide slab on both sides. Assume necessary data relevant to Nepal. [10]

Live load on roof = 2 KN/m²
 Live load on floor = 2.5 KN/m²
 Floor finishing = 1.5 KN/m²

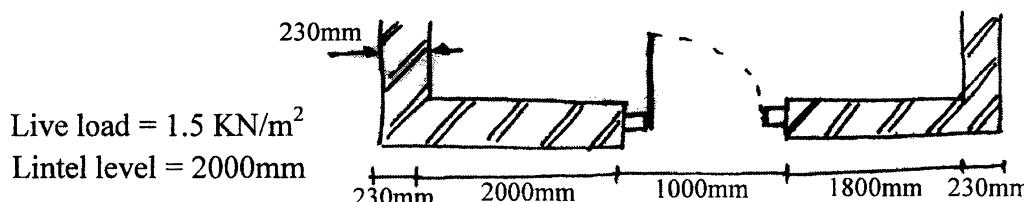


5. a) Explain about the typical damage in masonry structure under lateral loads. [4]
- b) A column section $400 \text{ mm} \times 800 \text{ mm}$ carries a load 200 kN acting at 160 mm from the 800 mm face and 350 mm from the 400 mm face. Determine the stress intensities at all four corners. [8]
- c) Describe the diagonal shear test for masonry wall. [6]

| Exam. | Regular | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

Subject: - Concrete Technology and Masonry Structure (CE603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
 - ✓ Attempt All questions.
 - ✓ The figures in the margin indicate Full Marks.
 - ✓ Assume suitable data if necessary.
1. a) How can the shape of aggregate affect the properties of hardened concrete? How does the grading of aggregate affect the water requirement of the mix? Also explain the effects of Alkali-Aggregate reaction. [2+2+1]
 - b) Describe the role of main compounds of cement on development of strength. [3]
 - c) List the admixture used in concrete. [2]
 - d) Describe concrete as three phase system. Explain the effect of transition zone in the properties of concrete. [6]
 2. a) How can you determine the workability of concrete using different methods at civil engineering construction site? [6]
 - b) What are the key concepts of Mix-design of concrete by using DOE method of mix-design? [6]
 - c) Describe shrinkage and creep of concrete. [4]
 3. a) Explain the electrochemical process of corrosion in reinforced concrete elements. How does the corrosion affect the concrete element? Explain with sketches. [6]
 - b) Describe various strength of concretes required for design of concrete structures along with their relation with the compressive strength [6]
 - c) Explain the measures for quality control of concrete in a construction site. [4]
 4. a) External wall of a single storeyed house is 230 mm thick and has door and window openings as shown in figure below. Plinth level is 1500mm above the top of foundation footing and floor ceiling height is 2800 mm. The one way R.C.C slab of 3500 mm clear span bears on walls and is 115 mm thick. Determine the maximum stress in the wall and calculate strength of the bricks and grade of mortar required for the wall. [10]



- b) How do you test the compressive strength of bricks and walls in laboratory? [6]
5. a) Explain the use of Masonry structures in civil engineering. Describe English bond and flemish bond of brick masonry with neat sketches. [2+4]
- b) A brick masonry wall of a single room building is 20 cm thick and is supported by 10 cm thick R.C.C slab at its top and bottom. The wall carries a vertical load (inclusive of its own weight) of 8000 Kg/m at the base at an eccentricity ratio of 0.1. The length of wall is 3 m between cross-walls. The clear height of storey is 3m. Determine the required crushing strength of bricks and the type of mortar to be used. Use modular bricks. [10]

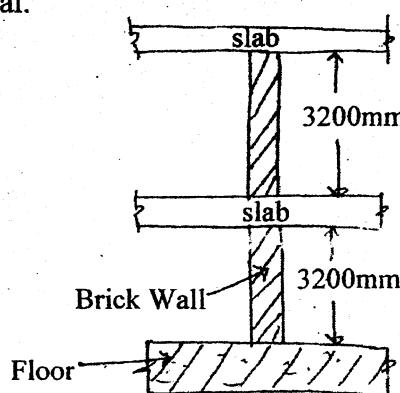
| Exam. | Regular | | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 h.s. |

Subject: - Concrete Technology and Masonry Structures (CE 603)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any Five questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.
- ✓ IS: 1905-1987, code of practice for structural Masonry is allowed.

1. a) What is the basic ingredients of concrete? Mention different types of admixtures used in concreting works. [3+3]
- b) Describe, in brief, concrete as three phase construction material. [6]
- c) Explain Bouge's compound of cement. [4]
2. a) Describe the stepwise process of mix-design of concrete by ACI method. [8]
- b) What measures do you recommend for quality control to concrete at site? Explain briefly. [8]
3. a) Define characteristic strength of concrete. The test results of a compressive strength test is given as follows: 30, 28, 25, 27, 23, 29, 31, 30, 30, 32 (Mpa). What will be the characteristic strength of the concrete? Make necessary assumption. [8]
- b) Explain the reasons for popularity of compressive strength test of concrete. Describe different methods of obtaining tensile strength of concrete. [8]
4. a) What is elastic deformation of concrete? Explain shrinkage and creep of concrete. [2+2+2]
- b) Explain non-destructive testing process of concrete and its features. [6]
- c) Explain, in brief, physical and chemical causes of concrete deterioration. [4]
5. a) Explain, with neat sketch Rat-trap bond and mention its advantages over others. [6]
- b) A load bearing brick masonry wall of a building is 250cm thick, is laterally supported by RCC slabs at top and bottom, which are 13cm thick each and clear height between slabs is 3.5m. If the wall has an axial load of 79.5kN/m at the base, inclusive of self weight, what should be the crushing strength of bricks and grade of mortar for the wall. Wall is 5m long between cross walls and bricks used are of modular size. Assume suitable if any data required. [10]
6. a) How do you test compressive strength of brick masonry wall? Describe the process of testing in brief. [6]
- b) Design an interior cross wall of a two-storeyed building to carry 125mm thick RCC slab with 3.2m ceiling height. The wall is unstiffened and supports a 2.50m wide slab on both sides. Assume necessary data relevant to Nepal. [10]

Live load on roof = 1.5KN/m²Live load on floor = 2.0 KN/m²Floor finishing = 1.2KN/m²



| Exam. | Regular / Back | | |
|-------------|----------------|------------|---------|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs. |

Subject: - Concrete Technology

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any Four questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Write the influence of followings on the strength and economy of cement concrete: [2.5+2.5]
 - i) Water cement ratio
 - ii) Shape of aggregate particles
- b) Write Bogue's compound of cement and describe their significance on strength gaining of concrete. [1+4]
2. a) Describe the quality of water to be used for the purpose of concreting. [3]
- b) Design the mix proportion for concrete with the help of following particulars using Department of Environment (DoE) method:
 Characteristics compressive strength, $f_{ck} = 35 \text{ MPa}$. Water cement ratio based on the compressive strength = 0.46. [7]
3. a) Explain the progress of crack formation in concrete with the increase of load. Use sketches. [5]
- b) Describe the importance of minimum tensile strength in concrete. How the tensile strength of concrete is measured in the laboratory? [5]
4. a) The compressive strength test results of a concrete specimen was found as 16; 17; 19; 21; 22; 25; 26; 27; 28 and 15 N/mm². Calculate the characteristics strength of the test result at 95% confidence level. [5]
- b) Explain with sketch the electrochemical process of rusting in reinforced concrete. [5]
5. a) What are the necessary measures for quality control of concrete in the field? Explain [5]
- b) Assuming standard conditions obtain porosity of concrete at the stage of 50%, 75% and 90% hydration. Assume W/C ratio as 0.5. [5]

Table for water content

| Maximum size of aggregate in mm | Types of aggregate | Water content in kg/m ³ of concrete with different workability | | | | |
|---------------------------------|--------------------|---|----------|-----|--------|------|
| | | Extreamly low | Very low | low | Medium | High |
| 10 | Uncrushed | ---- | 150 | 180 | 205 | 225 |
| | Crushed | ---- | 180 | 205 | 230 | 250 |
| 20 | Uncrushed | ---- | 135 | 160 | 180 | 195 |
| | Crushed | ---- | 170 | 190 | 210 | 225 |
| 40 | Uncrushed | ---- | 115 | 140 | 160 | 175 |
| | Crushed | ---- | 155 | 175 | 190 | 205 |

Table for standard deviation.

| Degree of control | Condition of production | Standard Deviation (S) in MPa | | | | | |
|-------------------|--|-------------------------------|-----|-----|-----|-----|-----|
| | | Grade of concrete | | | | | |
| | | M25 | M30 | M35 | M40 | M45 | M50 |
| Very good | Weight batching, control of aggregate grading and moisture content, frequent supervision, field and laboratory facilities. | 4.3 | 5.0 | 5.3 | 5.6 | 6.0 | 6.4 |
| Good | Weight batching, graded aggregate, periodic test, intermittent supervision, experienced worker. | 5.3 | 6.0 | 6.3 | 6.6 | 7.0 | 7.4 |
| fair | Volume batching, occasional supervision and test. | 6.3 | 7.0 | 7.3 | 7.6 | 8.0 | 8.4 |

01 TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2067 Magh

| Exam. | | Back | |
|-------------|---------|------------|--------|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs |

Subject: - Concrete Technology

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any **Four** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) Write short notes on size of aggregate used in concrete construction. How it is determined that aggregate is well graded or not from the grading curve? [3+2]
- b) Write short notes on physical properties of ordinary Portland cement and their effects on concrete behavior. [2+3]
2. a) What is the role of water in concrete? What are the advantages and draw backs of use of high water content in concrete? [3+2]
- b) Assuming that 1 cm^3 of cement produces 2 cm^3 of hydrated products under the standard curing condition (ASTM Standard), calculate the percentage of capillary porosity in the hydrated cement after 28 days. Take W/C = 0.5. [5]
3. a) Explain what are appropriate methods to be adopted and specific measures to be taken while concreting and curing in hot climate condition. [5]
- b) Explain what is nominal mix? What are the points to be considered in using nominal mix? [2+3]
4. a) Explain physical process of concrete deterioration. [2+3]
- b) Explain hydration of cement. How the different compounds of cement plays role in strength gaining of concrete. [1+4]
5. a) Explain use of different types of admixture as per ASTM standard. [5]
- b) Describe the shear strength of concrete. [5]

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 INSTITUTE OF ENGINEERING
Examination Control Division
 2067 Ashadh

| Exam. | | Regular/Back | |
|-------------|---------|--------------|---------|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs. |

Subject: - Concrete Technology

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any Four questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

- 37/0
1. a) Explain concrete as a structural material in comparison with steel. [5]
 - b) Define fineness modulus? Describe with suitable examples. [5]
 2. a) Describe the key steps in mix design of concrete using ACI method. [5]
 - b) Explain the hydration of cement in concrete. How different compounds of cement play role in strength gaining of concrete? [2+3]
 3. a) Describe the role of super-plasticizer as an admixture in the concrete. [5]
 - b) Calculate the theoretical strength of moist cured concrete containing 1kg of cement with 0.5 w/c ratio at the age of 28 days. Assume 90% hydration is completed in 28 days. [5]
 4. a) Explain the stress-strain behaviour of concrete in relation with progress of microcracks. [5]
 - b) How temperature affects compressive strength of concrete? Explain. [5]
 5. a) Describe the necessary process in quality control in concrete in the field. [5]
 - b) The compressive strength of concrete cubes as obtained from a laboratory test was as 26, 22, 26, 27, 23, 24, 22, 22, 28, 18, 25. What will be its characteristics strength? State necessary assumptions. [4+1]



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INSTITUTE OF ENGINEERING
Examination Control Division
2066 Bhadra

| Exam. | Regular / Back | | |
|-------------|----------------|------------|---------|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs. |

Subject: - Concrete Technology

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any Four questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Describe the major effects of C₃S, C₂S and C₃A on the properties of concrete. [5]
- b) Explain about gap-graded aggregates. What is the role of grading of aggregates in the strength of concrete? [3+2]
- ✓ 2. a) Describe about different uses of water in concrete. What is the role of water in concrete mixing? [5]
- b) Assuming that 1cm³ of cement produces 2cm³ of hydrated products under the standard curing conditions (ASTM standard). Calculate the percentage of capillary porosity in hydrated cement paste after 28 days. Take w/c ratio as 0.5 and assume 75% hydration in 28 days. [5]
- ✓ 3. a) Describe the step by step process of mix design of concrete by using British method. [5]
- b) Explain in brief about various methods of compressive and tensile strength tests of concrete. [5]
- ✓ 4. a) Explain with sketch various types of moduli of elasticity of concrete. [5]
- b) Explain in brief about corrosion of steel reinforcement in concrete. What are the preventive measures against corrosion? [2+3]
5. a) What is segregation of concrete? How segregation can be avoided in concrete? [2+3]
- b) Write short notes on:
 - i) Mineral and chemical admixtures
 - ii) Water cement ratio of concrete [2.5×2]

01 TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2066 **Jestha**

| Exam. | Back | | |
|-------------|---------|------------|---------|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs. |

Subject: - Concrete Technology

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any Four questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is Abram's rule of concrete strength? Describe two additional factors (not included in Abram's rule), which have a significant influence on concrete strength. [4+6]
2. a) Draw typical stress-strain curve for concrete. From this, how would you determine the static, dynamic and tangent modulus of elasticity? [1+4]
- b) Draw deformation curve (against time) of hardened concrete under constant load. Explain elastic recovery, plastic recovery and permanent deformation of concrete as per the curve. [1+4]
3. a) What is bulking of sand and what role does it play in concrete manufacturing process? [2+3]
- b) List different types of chemical admixtures used in concrete as per ASTM standard. What type of admixture would you recommend for concreting in [2+3]
 - i) Hot Weather
 - ii) Cold Weather
 - iii) Frequent freezing and thawing environment
 Explain with reason.
4. Describe the effect of water-cement ratio on porosity of concrete. What is the concept of Powers to calculate porosity of concrete? Suggest the proper w/c ratio in the view of durability of concrete as per weather condition. [2+5+3]
5. a) Explain the principal underlying in ACI method of concrete mix design to estimate amount of cement, water and aggregates. [6]
- b) Write the rational of the use of steel bars for reinforcing concrete. [4]

| Exam. | Back | | |
|-------------|---------|------------|---------|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs. |

Subject: - Concrete Technology

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any **Four** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) Define the entrapped air and entrained air in concrete. Why air entraining agent is used and how it works? Explain. [2+3]
- b) Explain the microstructure of ordinary Portland cement. [5]
2. a) How the well graded aggregate is better than others? On which basis you can say the aggregate is well graded? Explain it. [3+2]
- b) What are the basic principle of mix design of concrete? Which factors are not considered on DOE mix design method? Explain in brief. [2+3]
3. a) State the merits and demerits of cube and cylinder as specimen for compression test. Write the steps for compression testing of concrete from sampling. [2+3]
- b) Explain the importance of mineral and chemical admixture in concrete. [5]
4. a) Explain the stress-strain relationship of cement paste, aggregate and concrete based on concept of concrete as a three phase system [5]
- b) What are the physical causes of concrete deterioration, explain in brief. [5]
5. a) Calculate the percent of strength gain of a moist cured concrete containing 500gm cement and 0.45 w/c ratio at the age of 14 days. If 90% of 28 days hydration take place at 14 day normal curing. [5]
- b) What do you mean by quality control and quality assurance of concrete? How you can protect reinforcement from rusting on RCC structure? [2+3]

Examination Control Division
2065 Shrawan

| Exam. | Regular/Back | | |
|-------------|--------------|------------|---------|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs. |

***Subject:* - Concrete Technology**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any Four questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. What is workability? What are the different methods to control workability of concrete mix? Explain any one method of controlling workability of concrete mix. [2+2+6]
2. What are the different factors, influencing concrete mix design? How concrete mix is designed using Indian Mix Design Method? [5+5]
3. a) Describe the causes of concrete deterioration. [5]
b) Explain the function of tri-calcium silicate, di-calcium silicate and tri-calcium aluminate in the hydration of cement in concrete. [5]
4. Write the importance of the compressive strength of concrete in the design of reinforced concrete structures. Explain the method of determining compressive strength of concrete. [4+6]
5. Write short note on: [2×5]
 - a) Bleeding of concrete
 - b) Curing of concrete
 - c) Shrinkage in concrete
 - d) Bond between steel and concrete
 - e) Water cement ratio of concrete

01 TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2064 **Jestha**

| Exam. | Regular/Back | | |
|-------------|--------------|------------|---------|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs. |

Subject: - Concrete Technology

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt any **Four** questions.
- ✓ **All** questions carry equal marks.
- ✓ Codes IS 383; IS 456 are allowed.
- ✓ Assume suitable data if necessary.

1. a) Define flaky and elongated aggregate. How these aggregate affects the strength, workability and durability of concrete? Explain.
- b) Differentiate Ordinary Portland Cement (OPC) and Portland Pozzolana Cement (PPC) in terms of their physical and chemical properties.
2. a) Explain in brief the fundamental concepts that are commonly adopted in concrete mix design.
- b) Describe the flexural strength of concrete and their measurements.
3. a) Mention the various types of chemical and mineral admixtures used in concrete. Explain how the plasticizers can reduce the water content in concrete.
- b) Comment the properties of cements based on oxide and compound composition given below:

| Cement | Oxide and Compound Content (%) | | | | | | | | | |
|----------|--------------------------------|------|--------------------------------|--------------------------------|-----------------|------------------|------------------|------------------|-------------------|-----------|
| | SiO ₂ | CaO | Fe ₂ O ₃ | Al ₂ O ₃ | SO ₃ | C ₃ S | C ₂ S | C ₃ A | C ₄ AF | Free Lime |
| Cement-A | 22.4 | 68.2 | 0.3 | 4.6 | 2.4 | 69.2 | 12.0 | 11.7 | 0.9 | 3.3 |
| Cement-B | 25.0 | 61.0 | 3.0 | 4.0 | 2.5 | 20.0 | 56.6 | 5.7 | 9.1 | 1.0 |

4. a) Explain the effect of shrinkage and creep on concrete behaviour.
- b) Explain the compliance criteria of concrete as per IS 456.
5. a) Explain the influence of casting and curing temperatures on concrete strength and suggest the appropriate method of concreting in Kathmandu.
- b) Explain concrete corrosion (reason, mechanism and implication).
