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. [6]
   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]

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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. [4+2]
2. a) Define the concrete mix design of concrete. Describe the steps of Design mix of concrete by DOE method. [2+6]
   b) Explain quality control in site in different phase of construction. [4]
3. a) Describe the various strength tests on cement concrete. [6]
   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. [3+3]
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. [12]
   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. [8]

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

| Slump, mm | Water, Kg/m³ of concrete for indicated nominal maximum sizes of aggregate | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 9.5* | 12.5* | 19* | 25* | 37.5* | 50†* | 75†‡ | 150†‡ |
| | Non-air-entrained concrete | | | | | | | |
| 25 to 50 | 207 | 199 | 190 | 179 | 166 | 154 | 130 | 113 |
| 75 to 100 | 228 | 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 | 166 | 154 | — |
| Recommended average§total air content, percent for level of exposure: | | | | | | | | |
| Mild exposure | 4.5 | 4.0 | 3.5 | 3.0 | 2.5 | 2.0 | 1.5**†† | 1.0**†† |
| Moderate exposure | 6.0 | 5.5 | 5.0 | 4.5 | 4.5 | 4.0 | 3.5**†† | 3.0**†† |
| Extreme exposure‡‡ | 7.5 | 7.0 | 6.0 | 6.0 | 5.5 | 5.0 | 4.5**†† | 4.0**†† |

| Types of construction | Slump, mm | |
|---|---|---|
| | Maximum* | Minimum |
| Reinforced foundation walls and footings | 75 | 25 |
| Plain footings, caissons, and substructure walls | 75 | 25 |
| Beams and reinforced walls | 100 | 25 |
| Building columns | 100 | 25 |
| Pavements and slabs | 75 | 25 |
| Mass concrete | 75 | 25 |

| Nominal maximum size of aggregate, mm | Volume of dry-rodded coarse aggregate* per unit volume of concrete for different fineness moduli† of fine aggregate | | | |
|---|---|---|---|---|
| | 2.40 | 2.60 | 2.80 | 3.00 |
| 9.5 | 0.50 | 0.48 | 0.46 | 0.44 |
| 12.5 | 0.59 | 0.57 | 0.55 | 0.53 |
| 19 | 0.66 | 0.64 | 0.62 | 0.60 |
| 25 | 0.71 | 0.69 | 0.67 | 0.65 |
| 37.5 | 0.75 | 0.73 | 0.71 | 0.69 |
| 50 | 0.78 | 0.76 | 0.74 | 0.72 |
| 75 | 0.82 | 0.80 | 0.78 | 0.76 |
| 150 | 0.87 | 0.85 | 0.83 | 0.81 |

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/m$^3$ 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]

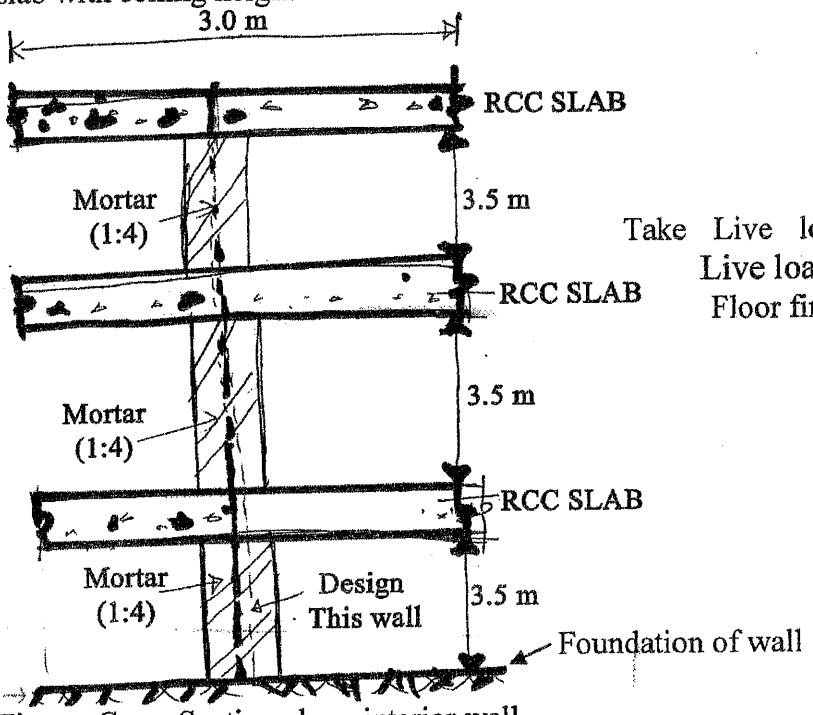
4. a) Explain Rebound Hammer test and Ultrasonic Pulse Velocity test. [6]

   b) Calculate the splitting tensile strength of concrete cylinder (300mm × 150mm dia) an 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]




Take Live load on roof = 2 KN/m$^2$
Live load on floors = 3.5 KN/m$^2$
Floor finishes = 1.5 KN/m$^2$

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]

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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2074 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**.*
- ✓ ***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 datas relivant to Nepal code.

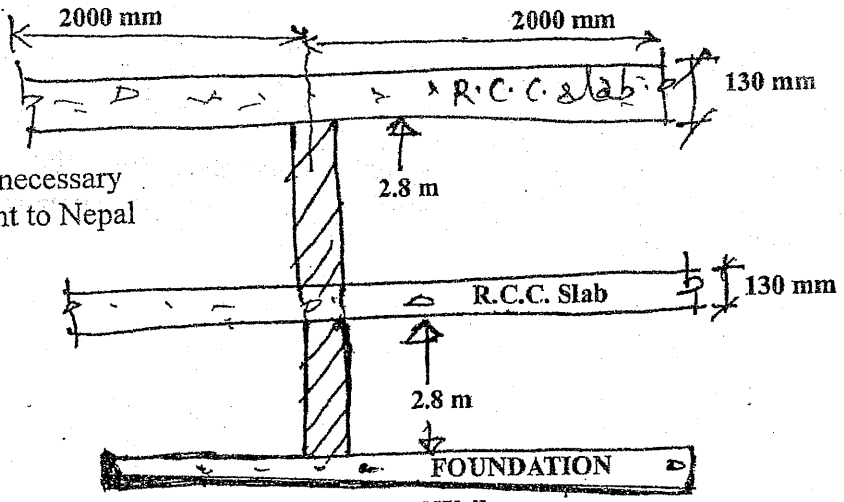


**Fig: Cross Section of Wall**

   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]
   b) List the elements of masonry structure resisting lateral loads. Describe the stepwise procedure for Diagonal shear test of Masonry structure. [2+5]

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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2075 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**.*
- ✓ ***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 $KN/m^2$
      Live Load on Floor = 2.0 $KN/m^2$
      Wt. of 60mm screed including finishing = 1.2 $KN/m^2$ [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]

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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2073 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.*
- ✓ *Use of **IS: 1905-1987** is allowed to design Masonry Structure.*

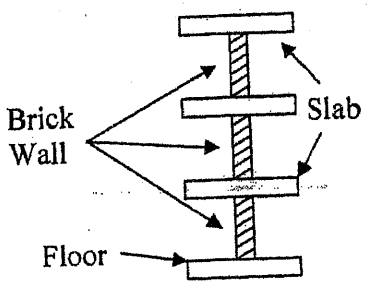
1. a) State briefly the mechanical properties of aggregate. What is the meaning of fineness modulus of aggregate value 7? [5+1]
   b) Describe concrete as three phase system. Explain the effect of transition zone in the properties of concrete. [4+2]
2. What do you mean by shrinkage, creep, segregation and bleeding in concrete? Write down the step-wise process for DoE method of concrete mix design. [6+6]
3. a) How does the size of aggregate affect the strength of concrete? How does variation in water cement ratio affect the property of concrete? [3+3]
   b) List out the non-destructive testing of concrete. How these methods are useful? [3+3]
   c) Explain the methods of testing concrete for compressive and flexural strength. [4+2]
4. a) Describe physical causes of concrete deterioration. [6]
   b) Explain various types of Brick bonds in masonry structures with neat sketches. What are the advantages and disadvantages of Rat Trap Bond. [4+2]
5. Referring to figure below, design an interior cross wall of 3 storeyed building to carry 125 mm thick RCC slab with ceiling height of 3 m and the wall is 3 m long which is stiffened and supports 3 m slab on both sides, [12]

   Live Load on roof = 2 KN/m$^2$

   Live Load on floor = 2.5 KN/m$^2$

   Floor Finish = 1.5 KN/m$^2$

   Assume relevant necessary data.




6. a) Describe the elements of lateral load resisting masonry system with sketch. Elaborate the typical damages in masonry structure under lateral loads. [4+4]
   b) Describe with sketches, the diagonal shear test and flat jack test. [6]

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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 I/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 behavoiur 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]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2073 Shrawan**

| 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/$m^2$
   Live load on floor = 2.0 KN/$m^2$
   Floor finishing = 1.2 KN/$m^2$
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]

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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2072 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.*

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 datas: [10]

   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 quanlity of ingredients of concrete for 2 $m^3$ concrete production. (Assume all necessary relevant datas)

   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. [6]
   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. [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? Assume that joints are not ranked. [10]
5. a) Explain the effect of lateral loads on masonry wall with and without opening in wall. [6]
   b) Describe the diagonal shear test for wall. [6]
   c) List the name of destructive tests and non-destructive (NDT) tests in masonry wall. [4]

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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2072 Kartik**

| 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: [8]
   Design parameters:
   Characteristic strength $f_{ck} = 30\ N/mm^2$
   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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06 TRIBHUVAN UNIVERSITY
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 theoritical 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 $N/m^2$. 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]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2071 Shawan**

| 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]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2070 Chaitra**

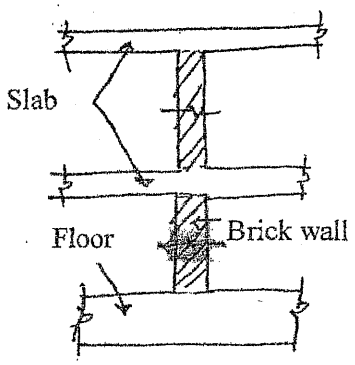
| Exam. | Regular | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

***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.*

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: [8]
      Characteristics compressive strength, fck = 30 Mpa
      Water cement ratio based on the compressive strength = 0.48
      Assume all necessary data.
   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/$m^2$
      Live load on floor = 2.5 KN/$m^2$
      Floor finishing = 1.5 KN/$m^2$



5. a) Explain about the typical damage in masonry structure under lateral loads. [4]

   b) A column section 400 mm × 800 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]

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2069 Chaitra**

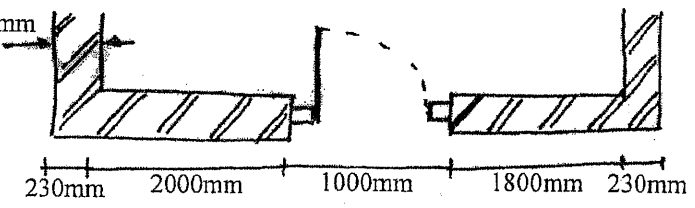
| Exam. | Regular | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

***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.*

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 conerate 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]

Live load = 1.5 KN/m$^2$
Lintel level = 2000mm




   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 flemesh 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]

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
# Examination Control Division
**2070 Ashad**

| Exam. | Old Back (2065 & Earlier Batch) | | |
|---|---|---|---|
| Level | BE | Full Marks | 40 |
| Programme | BCE | Pass Marks | 16 |
| Year / Part | III / I | Time | 1½ hrs. |

## *Subject:* - Concrete Technology *(EG633CE)*

- ✓ 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 soundness and Abrasion strength. [5]

   b) Find the mean strength, standard deviation, and coefficient of variation of the cubes given in table: [5]

| Cubes | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Strength ($N/mm^2$) | 170 | 200 | 190 | 160 | 180 | 195 |

2. a) Explain the phenomenon of corrosion in steel reinforcement in RCC. Discuss the preventive measures against corrosion of steel in RCC structures. [5]

   b) Explain about Elastic and Plastic properties of concrete. [5]

3. a) 'Ordinary Portland Cement' is admirably suitable for general concrete construction work. Justify the statement with reference to Bogue's equation. [5]

   b) Explain briefly about the differences between accelerating admixtures and retarding admixtures. [5]

4. a) Differentiate between the nominal mix and design mix concrete. List out the information required for mix design of concrete. [5]

   b) Explain in brief the role of water/cement ratio in concrete and methods of decreasing this ratio. What is super plasticizer? Write three benefits of using super plasticizer in the concrete. [5]

5. Write short notes on: (any four) [4×2.5]
   a) Physical Properties of concrete
   b) Steam curing of concrete
   c) Bond between steel and concrete
   d) Flakiness index of aggregate
   e) Shear strength

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04 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2068 Chaitra**

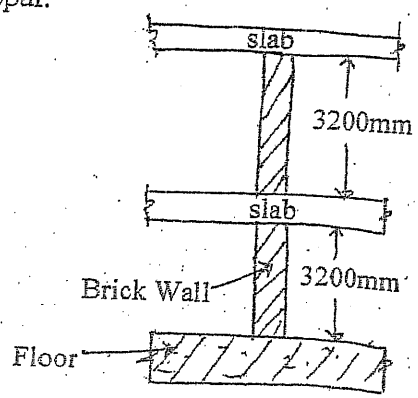
| Exam. | Regular | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BCE | Pass Marks | 32 |
| Year / Part | III / I | Time | 3 hrs. |

***Subject:*** - Concrete Technology and Masonry 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/m$^2$
Live load on floor = = 2.0 KN/m$^2$
Floor finishing = = 1.2KN/m$^2$

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01 TRIBHUVAN
INSTITUTE OF ENGINEE
Examination Control Divi n
2064 Jestha

Year / Part

*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 | $Fe_2O_3$ | $Al_2O_3$ | $SO_3$ | $C_3S$ | $C_2S$ | $C_3A$ | $C_4AF$ | 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).

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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
2068 Baishakh

| 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: [7]
   Characteristics compressive strength, $f_{CK}$ = 35MPa. Water cement ratio based on the compressive strength = 0.46.
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/mm$^2$. 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]

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Table for water content

| Maximum size of aggregate in mm | Types of aggregate | Water content in kg/m3 of concrete with different workalibility | | | | |
|---|---|---|---|---|---|---|
| | | 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 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.*

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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TRIBHUVAN UNIVERSITY
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. |

146 - copies
Zerox

*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 $C_3S$, $C_2S$ and $C_3A$ 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 $1cm^3$ of cement produces $2cm^3$ 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 seggregation of concrete? How seggregation can be avoided in concrete? [2+3]
   b) Write short notes on: [2.5×2]
      i) Mineral and chemical admixtures
      ii) Water cement ratio of concrete

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