

TED (15) 5011  
[Revision 2015]

Reg.No. ....  
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/  
COMMERCIAL PRACTICE - APRIL 2018.

BUILDING MAINTENANCE AND SERVICES

[Maximum Marks : 100]

Time : 3 Hrs

PART-A  
[Maximum marks: 10]

Marks

- I. Answer all questions in one or two sentences. Each question carries 2 marks.
1. Define durability of concrete structure.
  2. List the classification of building failure.
  3. List out causes of fire in building.
  4. List different building services.
  5. Define retrofitting of structures.

(5x2 = 10)

PART - B

(Maximum mark: 30)

- II. Answer any five of the following questions. Each question carries 6 marks.

1. Explain factors affecting the life expectancy of a building.
2. Write short note on special maintenance.
3. Explain the causes of cracks in concrete.
4. Describe about ELCB and MCB.
5. List the requirements of domestic gas pipe line.
6. Discuss the factors considered in the selection of materials for repair.
7. Explain causes of deterioration of monumental building.

(5x6 = 30)

PART C

(Maximum mark: 60)

(Answer any full question from each unit. Each full question carries 15 marks)

UNIT – I

- III. a. Describe the effect of natural agents on durability of structures. (8)  
b. Explain planning aspects of maintenance (7)

OR

- IV. a. Explain in detail different types of maintenance of buildings (8)  
b. Describe the effect of marine environment in the durability of structures (7)

UNIT – II

- V. a. Explain the causes of corrosion of reinforcement and steel structures (8)  
b. Explain defects in masonry walls and its remedial measures (7)

OR

- VI. a. Describe defects in painting and its causes (8)  
b. Explain the factors for failure of foundation and remedial measures (7)

UNIT – III

- VII. a. Explain defects in water supply system and preventive measures (8)  
b. Explain in detail about the air conditioning system in buildings (7)

OR

- VIII. a. Describe defects in sewage system and preventive measures (8)  
b. Explain different electrical installations in buildings (7)

UNIT – IV

- IX. a. Explain with neat sketches classification of shoring technique and its functions. (8)  
b. Explain ferrocement as a repair material (7)

OR

- X. a. Explain in detail strengthening of column by jacketing (8)  
b. Describe different repair materials used for the repair of concrete structures. (7)

# Building Maintenance & Services.

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1. Define Durability of Concrete Structure?

Ans. It is the resistance to weathering action, chemical attack, abrasion and other degradation processes.

2. List the classification of building failure?

Ans. Structural failures - failure in foundation, RCC frames  
Non-structural failure - failure in plastering

3. List out the causes of fire in building

Ans. → Near fire products  
→ Electrical equipment  
→ Fault wiring

4. List different building services.

Ans. Lift, plumbing, water supply, electrical services, Telephone service

5. Define retrofitting of structures?

Retrofitting refers to the addition of new technology or features to older systems.

## PART-B

II

1. Explain factors affecting the life expectancy of a building

Ans. Air pollution.

Moisture

Biological agents

Atmospheric Condition.

Saline characteristic?

2. Write short note on special maintenance?

Ans. The repairs carried out overcome special problems as soon as they occur are known as special repairs. Special repairs of buildings includes the following jobs of maintenance works

1. Strengthening of foundation and foundation soil.
2. Rectification of leaking roofs
3. Repairs to damaged concrete surface.
4. Repairs to cracks in masonry walls.
5. Repairs to damaged floors.
6. Repairs to expansion joints.

3. Explain the causes of cracks in concrete?

Ans.   
→ Temperature and plastic shrinkage  
→ Thermal variations  
→ Drying shrinkage  
→ chemical reaction

- weathering
- poor construction practices
- construction overloads.

4. Describe about ELCB and MCB?

Ans.

ELCB - Earth Leakage circuit breaker - It is used to protect the circuit from electrical leakage. when someone gets an electric shock then this circuit breaker cuts off the power at the time of 0.1 Secs.

MCB - Miniature Circuit Breaker.

MCB is an electromechanical device which guards an electrical circuit from an over current, that may effect from short circuit, overload or imperfect design.

5. List the requirement of domestic gas pipe line

Ans. → Ensuring that the gas pipeline can be continuously identified

→ The piping system must be designed so that the gas meter provided by gas supplier can be properly located for the building of the owner or each customer

→ The route should avoid any position where the pipe could be liable to damage, during the building operation

6. Discuss the factors considered in the selection of materials for repair.

Ans. → Excellent bonding material

- > water proofing & Resistance to  $CO_2$  penetration.
- > Temperature compatibility
- > Corrosion resistance
- > Bonding with old structure.

7. Explain causes of deterioration of monumental building?

- > Air pollution
- > Acid rain
- > climatic cause
- > Efflorescence
- > Etching
- > Landslide
- > Saline action
- > man-made cause
- > Biological cause.

### PART - C

III

a. Describe the effect of natural agents on durability of structure?

- > Climate change.
- > High humidity & wind-driven
- > Freezing and Thawing :- The most potentially destructive weathering factor is Freezing and

thawing while the concrete is in wet.

→ Sulphate Attack :- Excessive amounts of Sulphate in soil or water can attack and destroy a concrete that is not properly designed.

→ Moisture :- change in moisture content effect the structures badly.

b. Explain planning aspects of maintenance?

→ Annual Maintenance - The periodic or routine maintenance

→ Special repair :- Repair carried out to overcome special problems as soon as they occur.

ivb Describe the effect of marine environment in the durability of structures.

Ans. The Marine environment cause high Sulphate attack to the building. Sodium Sulphate can attack concrete by reacting with hydrated compounds in the hardened cement paste.

The presence of seawater cause the corrosion of steel structures.

IV a. Explain in detail different type of maintenance of buildings

Ans. → Routine Maintenance :- The day-to-day or through repairs carried out in buildings after specified period are known as routine or periodical maintenance. This includes the following items of repair works

1. Repairs to plastered surface
2. white washing and colour washing
3. Distemping
4. painting of timber and steel surface
5. Repairs to damaged parts of flooring
6. Removal of stains from concrete and terrazzo floors.

→ Special Repairs :- The repairs carried out overcome special problems as soon as they occur.

This includes the following

1. Strengthening of foundation and foundation soils
2. Rectification of leaking roofs
3. Repairs to damaged concrete surface.
4. Repairs to cracks in masonry walls.
5. Repairs to damaged floors.
6. providing damp-proof course in the existing building

b. Describe the effect of marine environment in the durability of structures

va. Explain the Causes of Corrosion of reinforcement and Steel Structure?

Ans. 1. Presence of Cracks in Concrete :-

2. presence of moisture

3. permeability of Concrete

4. Carbonation

5. chlorides

6. Sulphate attack

7. Alkali Aggregate ~~attack~~ Reaction

8. Inadequacy of Cover.

b. Explain defects in masonry walls and its remedial measures?

Ans. Cracks in masonry walls may be minor or wider. Development and formation of cracks in masonry may be due to:

(i) poor quality of materials

(ii) Bad workmanship

(iii) Uneven settlement of foundation

(iv) Heavy concentration of loads.

Remedial Measures:

→ when the cracks are minor, these are generally filled by cement grouting. For this purpose, the cracked surface is cleaned and thoroughly washed with water. The cement grout is applied thin to the crack by means of cement gun and the surface is finished as desired.

→ In case of wider cracks existing on the surface of masonry wall, the cracks are filled by using expansion cement slurry.

VII  
a. Describe defects in painting and its causes

Ans. Pitting:- Pitting consists of small holes on the surface due to wear and tear.

Cracking :- Cracking due to improperly prepared surface, faulty workmanship... etc.

Spalling:- Spalling occur near the joints as joints are with weak mortar.

b. Explain the factors for failure of foundation and remedial measures?

Ans. Causes of foundation failure

→ Movement of expansive and highly plastic soil beneath different sections of the foundation footings.

→ presence of poor soil

→ poor drainage from run-off discharging at the base of the foundation.

→ plumbing leaks

→ Faulty design of foundation.

Remedial Measure

1. Additional Horizontal Diagonal Plinth beams

2. Reinforced types of beams below the basement

3. Under-reamed Piles.

a. Explain defects in water supply system and preventive measures

Ans. → Broken Seals:- when appliances were installed, the ~~low~~ seals around all water connections are provided. As appliance age, the seal may break. This cause damage in water supply system.

→ Corrosion

→ Damaged Pipe Joints

→ Excess water pressure.

Preventive measure

1. Clean out roof gutters

2. Use a chain snake instead of unclogging chemicals.

3. Never pour grease down sink.

b. Explain in detail about the air conditioning system in buildings

1. Central - System of air conditioning

2. Self-contained system

3. Unitary air conditioning system.

Central System:- In this air is conditioned at one centralised place and then it supplied to serve several different rooms or spaces which are to be treated.

Self contained system:- packaged equipment provided as complete conditioned system for one enclosure.

→ Semi Contained System & Combined System:-  
They are rarely used. In general for a small enclosure a Self Contained System is used while for a building a central System which provide air conditioning round the year is used.

VIII  
a. Describe defects in Sewage System and preventive measures?

Ans. → Equipment failure

→ wild life:- → Root in pipe line

→ Trees → Cracked pipe

→ weather → Broken Seal

Preventing measure

→ Remove waste in Sewage pipe line

→ prevent the entry of root tree root

→ Broken Seal cause foul smell this can be prevented by ensure sufficient bar Seal.

b. Explain in detail different electrical installation in buildings

1. Lighting requirements with required illumination levels

2. Ceiling fan, air circulators and exhaust fans

3. Electrical Geysers.

4. Electrical pump for water supply

5. Electrical Elevators

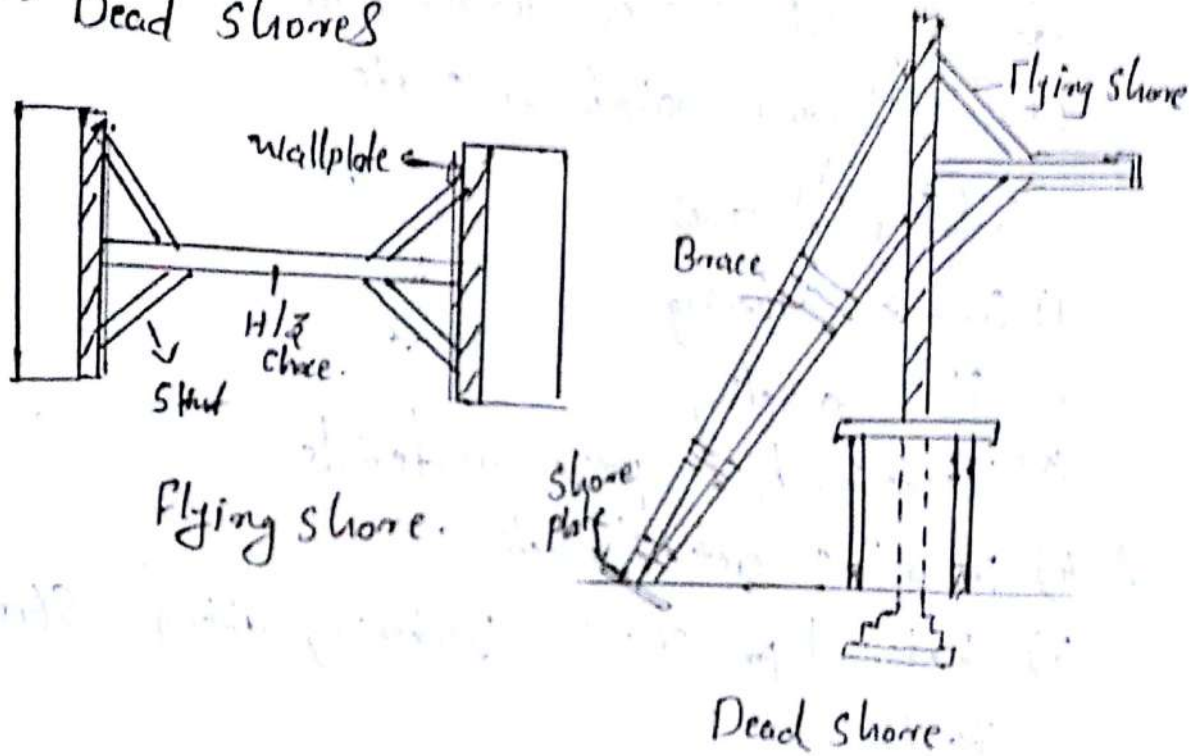
6. Air-Conditioning units.

IX  
a

Explain with neat sketches classification of Shoring technique and its functions.

Ans.

- > Raking shores
- > Flying shores
- > Dead shores



b. Explain Ferro cement as a repair material

Ferro cement is a composite material, in which the filler material, cement mortar is reinforced with fibres, usually steel mesh dispersed through out the composite. The fibres imparts tensile strength to the mass. In ferro cement structures, the reinforcement consist of a small diameter wire meshes, where in uniform distribution of reinforcement is made possib throught the thickness of the element.

Qa. Explain in detail Strengthening of Column by Jacketing

Ans. Repairing and Strengthening of reinforced Concrete elements is required for several reasons namely: damages, extension of lifetime and Serviceability of Structure. Lack of Structure maintenance etc.

Jacketing techniques

- 1) Concrete Jacketing
- 2) Steel Jacketing
- 3) Jacketing by Composite materials
- 4) Precast Concrete Jacketing
- 5) External pre-stressing Jacketing using Steel stands

b. Describe different repair materials used for the repair of concrete structure.

- Ans.
- 1) Cement Slurry
  - 2) Cement Mortar
  - 3) Epoxy resins
  - 4) Polymer cementsitious modified products:
    - > Polyvinyl Acetate
    - > Styrene butadiene rubber
    - > Polyvinyl diene dichloride
    - > Acrylics.