



BANGLADESH TECHNICAL EDUCATION BOARD

Agargoan, Dhaka-1207

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM
SYLLABUS (PROBIDHAN-2016)

CIVIL TECHNOLOGY

TECHNOLOGY CODE: **664**

5th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

CIVIL TECHNOLOGY (664)

5th SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total
						Theory		Practical		
						Cont. assess	Final exam	Cont. assess	Final exam	
1	66451	Construction Process-II	2	3	3	40	60	25	25	150
2	66452	Surveying-III	2	3	3	40	60	25	25	150
3	66453	Water Supply Engineering	2	3	3	40	60	25	25	150
4	66454	Theory of Structure	2	3	3	40	60	25	25	150
5	66455	Estimating & Costing-II	2	3	3	40	60	25	25	150
6	66456	Hydraulics	2	3	3	40	60	25	25	150
7	65851	Accounting Theory & Practice	2	3	3	40	60	50	0	150
Total			14	21	21	280	420	200	150	1050

AIMS

After completion of the course the students will be able to:

- Understand the construction process of arch and lintel.
- Understand the construction process of different types of floor.
- Understand the construction process of stairs.
- Understand the construction process of different types of roof.
- Understand the different finishing works in building.
- Understand the construction process of doors and windows.
- Understand the different operation and maintenance construction equipment.
- Understand the construction of bridge, culvert, canals etc.

SHORT DESCRIPTION

Arches; Lintels; Ground floors; Upper floors; Damp proofing; Termite treatment; Stairs; Roof; Pitched roof; Plastering and pointing; Doors; Windows; Carpentry and joinery; Scaffolding; Form works, Pointing & Varnishing, construction equipment, Building Services, Insulation, bridge/culverts and canals etc.

DETAIL DESCRIPTION**1. Understand the different type of arches and lintels.**

- 1.1 State the meaning of arch and lintel.
- 1.2 Mention the functions of arch and lintels.
- 1.3 List the common terms used in arches and lintels.
- 1.4 Mention the different type of arches according to their shape, center and material.
- 1.5 Describe the correct procedures of construction of arches and lintels.

2. Understand the floor.

- 2.1 Mention the components of a floor.
- 2.2 Mention the essential requirements of a floor.
- 2.3 Name the suitable materials used for the construction of floor.
- 2.4 Describe the construction procedure of the following type of floors:
Brick floor, Brick concrete floor, Terrazzo floor, Mosaic floor, Tiled floor, Marble floor, Timber floor, Reinforced Glass floor, Cork floor, Glass floor, Plastic floor, Ribbed floor, Solid floor, Hollow floor, Composite floor, Rubber paint floor, Epoxy paint floor

3. Understand the dampness of building.

- 3.1 Mention the causes and ill effects of dampness in building.
- 3.2 Describe the methods of damp proofing of building.
- 3.3 Define efflorescence.
- 3.4 Describe remedial measures against efflorescence.
- 3.5 Mention the requirements of an ideal damp proofing material.
- 3.6 Describe the damp proof course (DPC) treatment for wall with sketches.
- 3.7 Mention the function of PVC felt used in basement.
- 3.8 State the function of rubber stopper to prevent the leakage of water.
- 3.9 State the function of water proofing agent.

4. Understand the damages due to termite in building.

- 4.1 Identify different type of termites.
- 4.2 Explain the damages due to termite in building on economic point of view.
- 4.3 Name the chemicals used for anti-termite treatment.
- 4.4 Describe the methods of pre-construction anti-termite treatment.
- 4.5 Describe the methods of post-construction anti-termite treatment.

5. Understand the stairs.

- 5.1 Differentiate between stairs and staircase.
- 5.2 Mention the functions and location of stairs.
- 5.3 Define the technical terms used in stairs.
- 5.4 Mention the requirements of a good stair.
- 5.5 Express the relationship between tread and riser.
- 5.6 List the suitable materials for construction of stairs.
- 5.7 Mention the classification of stairs.
- 5.8 Make a Plan of a staircase for a building from a given stair hall and room height.

6. Understand the roofs.

- 6.1 List the different kind of roofs.
- 6.2 Mention the functions of a roof.
- 6.3 Mention the essential requirements of a good roof.
- 6.4 Define the technical terms used in roofs.
- 6.5 Compare the advantages and limitations of flat roof over pitched roof.
- 6.6 Describe the construction procedure of a lean-to-roof.
- 6.7 Distinguish between king post truss and queen post truss.
- 6.8 Mention the advantages of steel trusses over wooden trusses.
- 6.9 Materials required for buildup section and rolled section.

7. Understand the plastering and pointing finishing works.

- 7.1 Describe the various types of plaster on the basis of their suitability and uses.
- 7.2 Name the different kinds of pointing with sketches.
- 7.3 State the purpose of plastering and pointing.
- 7.4 Mention the common tools used for plastering and pointing works with their functions.
- 7.5 Describe the process of applying plaster on new surface and old surface.
- 7.6 Mention the common defects in plastering and pointing.
- 7.7 State how the defects of plastering and pointing can be rectified.
- 7.8 Distinguish between plastering and pointing.
- 7.9 State the meaning of acoustics tiles, aluminum cladding panel (ACP), rustic tiles.

8. Understand the doors.

- 8.1 Identify the technical terms used in doors.
- 8.2 Mention the factors to be considered in determining the size, shape, location and number of doors in a room.
- 8.3 Describe the various types of doors on the basis of their suitability and uses.
- 8.4 Mention the advantages and limitations of the followings:
Panel door, Flush door, Glazed door, Fire proof door, Auto censor door, Composite door, Louvered door, Mild steel sheet door, Sliding door, Swing door, Collapsible door, Rolling shutter door, Revolving door, Plastic door.
- 8.5 Describe the methods of fixing door frames.

9. Understand the windows.

- 9.1 Mention the factors to be considered to determine the size, shape, location and number of windows in a room.
- 9.2 Describe the various types of windows on the basis of their suitability and uses.
- 9.3 Mention the advantages and limitations of the followings:
Fixed window, Pivoted window, Steel casement window, Sliding window, uPVC channel window, Louvered window, Bay window, Glazed window, Corner window, Dormer window, Gable window, Lantern window
- 9.4 State the functions of skylight, sunlight, fanlight and ventilator.
- 9.5 Describe the methods of fixing windows.
- 9.6 Compare among the wooden, steel and aluminum glazed window.

10. Understand the importance of scaffolding.

- 10.1 State the meaning of scaffolding.
- 10.2 Explain the necessity and uses of scaffolding.
- 10.3 Name the different types of steel scaffolding.
- 10.4 Name the different components of scaffolding.
- 10.5 Advantages of ringlock scaffolding as compared with general steel scaffolding.
- 10.6 Advantages of cuplock scaffolding as compared with general steel scaffolding.
- 10.7 Installation process of ringlock scaffolding.
- 10.8 Installation process of cuplock scaffolding.
- 10.9 Compare the advantages and limitations of timber scaffolding over steel scaffolding.
- 10.10 Differentiate between shoring and scaffolding.
- 10.11 Describe the safety requirements for scaffolding works.

11. Understand the significance of form works.

- 11.1 State, form works, centering and shuttering.
- 11.2 Explain the necessity and uses of form works.
- 11.3 Name the different components of form works.
- 11.4 Mention the essential requirements of a good form work.
- 11.5 Describe the process of making form works of the followings:
 - a. Column
 - b. Beam and slab
 - c. Stair
 - d. Wall
 - e. Lift core
 - g. Share wall
- 11.6 Describe the specifications for cleaning & treatment of forms and scrapping of form works.
- 11.7 Describe the removal technique of form works.
- 11.8 Describe the methods for fair face concreting.

12. Understand the process of painting & Varnishing.

- 12.1 State the purpose of painting & varnishing.
- 12.2 Name the ingredients of paint & varnishes.
- 12.3 Mention the specific function of each ingredient of paint & varnishes.
- 12.4 Describe the characteristics of good paints & varnishes.
- 12.5 State the various defects in painting & varnishing.
- 12.6 Describe the factors that should be considered during the supervision of quality painting & varnishing work.
- 12.7 Differentiate between the properties and ingredients of the following:
 - a. White wash and color wash.
 - b. Distemper and snowcem wash.
 - c. Weather coat and white wash.
 - d. oil based paint and water based paint
 - e. Weather coat and distemper
 - f. plastic emulsion paint and synthetic enamel paint

12.8 Describe the procedure of application of the following on new and old surfaces:

- a. White wash b. Color wash c. Distemper d. Weather coat
- e. Epoxy paint f. Rubber paint g. Plastic emulsion paint h. Synthetic enamel paint
- i. Snowcem (cement based paint)

13. Understand the necessity of equipment in construction works.

- 13.1 List the equipment required for construction works.
- 13.2 Mention the specific use of the each equipment required for construction works.
- 13.3 Describe the operation and maintenance of different pumps used in construction works.
- 13.4 Describe the operation and maintenance of earth excavating machine, bulldozer machine, roller machine, brick cutter machine, crushing (brick/stone) machine, concrete pump machine, concrete hoisting equipment.
- 13.5 Describe the operation and maintenance of different conveyor used in construction works.
- 13.6 State the function of vibrator machine.
- 13.7 Describe the operation and maintenance of plate compactor, hammer/frog hammer, Compactor.

14. Understand the necessity of different building services.

- 14.1 State the necessity of different building services.
- 14.2 Classify different kinds of building services.
- 14.3 Describe the procedure of gas line installation in building.
- 14.4 Describe the layout of electrical wiring with various fittings in building.
- 14.5 Describe the process of installation of mechanical ventilation and air- conditioning system in building.
- 14.6 Describe the method of installation of elevator or lift and escalator system in a building.
- 14.7 Describe the fire protection and detection system in a building.
- 14.8 Define smoke detector, heat detector and fire alarm.
- 14.9 Describe the procedure of smoke detector, heat detector and fire alarm in firefighting system.

15. Understand building codes and building by laws.

- 15.1 State different codes followed in construction methodology.
- 15.2 State the main features of Bangladesh National Building Code (BNBC), 2015 and Building Construction Rules-2015 by Public Works Department (PWD) Bangladesh with latest update in construction industry.
- 15.3 Define building bye laws.
- 15.4 Explain the municipal regulation in building planning.
- 15.5 Describe the importance of building bye laws.
- 15.6 Describe the economical planning of a residential building.
- 15.7 Define orientation of a building
- 15.8 Describe the effects of orientation of building on the basis of local climates.

16. Understand the different insulation in building.

- 16.1 Define thermal and sound insulation.
- 16.2 State the necessity of thermal and sound insulation in building.
- 16.3 List various types of materials used for thermal and sound insulation.
- 16.4 Describe the general methods of thermal and sound insulation in building.
- 16.5 Describe the process of thermal insulation of the following with neat sketches:
 - a. Floor. b. Roof. c. Exposed wall. d. Exposed door and window.

17. Understand the construction process of dam, embankment and irrigation and drainage canal.

- 17.1 Define levee, dyke, spur, groyne, dam and embankment.
- 17.2 State the necessity of dam and embankment.
- 17.3 Describe the procedure of selection of alignment.
- 17.4 Describe the factors to be considered in designing dam and embankment.
- 17.5 Describe the process of maintenance of dam and embankment.
- 17.6 Describe the procedural steps of construction of irrigation and drainage canal.
- 17.7 Describe the process of maintenance of irrigation and drainage canal.

18. Understand the construction process of bridge and culvert.

- 18.1 State different types of bridge and culvert.
- 18.2 Distinguish between bridge and culvert.
- 18.3 Mention different components of bridge and culvert.
- 18.4 Describe the process of setting out plan of bridge and culvert.
- 18.5 Describe the procedural steps of construction of bridge and culvert.
- 18.6 Explain the necessity of inspection of bridge and culvert for maintenance.
- 18.7 Describe the factors to be considered for inspection of bridge and culvert.

PRACTICAL:

1. Construct a semi-circle/segmental brick arch.

- 1.1 Select the required tools and raw materials.
- 1.2 Make form works with suitable materials.
- 1.3 Prepare cement mortar as required.
- 1.4 Place the bricks on proper position with cement mortar.
- 1.5 Do the curing of the brick work properly.
- 1.6 Remove the form works.

2. Construct any one of the following floors with suitable materials.

Brick floor; Brick concrete floor; Terrazzo floor; Mosaic floor; Tiled floor; Timber floor; RCC solid floor; RCC ribbed floor

- 2.1 Select the required tools and raw materials.
- 2.2 Prepare the floor according to standard specification.
- 2.3 Clean the work site.
- 2.4 Deck floor using steel deck sheet with RCC topping.

3. Perform a case study of dampness in building.

- 3.1 Identify a damped building.
- 3.2 Investigate the reasons of dampness for major affected areas and causes.
- 3.3 Select the method of damp proofing.
- 3.4 Estimate the materials to be needed for damp proofing.
- 3.5 Prepare a report on the specified case of dampness in building.

4. Construct the form work of a stair.

- 4.1 Collect the required tools and raw materials.
- 4.2 Draw a neat sketch of stair (at least ten nos. steps) with waist slab shutter.
- 4.3 Make the bottom supports and erect inclined way.
- 4.4 Fix the steps and side of steps.
- 4.5 Check the accuracy of the works in all respects.

5. Construct a wooden lean-to-roof, queen post roof truss, king post roof truss.

- 5.1 Collect the required tools and raw materials.
- 5.2 Draw the neat sketch with dimensions.
- 5.3 Make the joints and assemble the members.
- 5.4 Erect the proper position.
- 5.5 Check the accuracy of the work.

6. Perform cement plastering to brick walls.

- 6.1 Collect the required tools and raw materials.
- 6.2 Clean the loose materials from the surface.
- 6.3 Raking out all the joints up to required depth.
- 6.4 Wash the surface with water.
- 6.5 Prepare cement mortar as required proportion.
- 6.6 Provide dots and check the thickness of cement plaster.
- 6.7 Provide the screed properly.
- 6.8 Apply mortar (top to bottom and left to right).
- 6.9 Plain / level the surface as possible.

7. Perform pointing works to a boundary wall.

- 7.1 Collect the required tools and raw materials.
- 7.2 Clean the loose materials from the surface.
- 7.3 Raking out all the joints up to required depth.
- 7.4 Wash the surface with water.
- 7.5 Prepare cement mortar as required proportion.
- 7.6 Apply mortar to the joints and press (top to bottom and left to right).
- 7.7 Check the joints accordingly.
- 7.8 Do curing accordingly.

8. Construct a single layer and double layers scaffolding.

- 8.1 Collect the required tools and raw materials.
- 8.2 Erect the vertical members.
- 8.3 Place the horizontal members and tied with jute rope.
- 8.4 Place the boards for platform.
- 8.5 Provide the bracings accordingly.
- 8.6 Check the properness of the scaffolding work.
- 8.7 Disassemble all the members and store the materials used.

9. Prepare form works for columns/ beams, lift cores /share walls.

- 9.1 Collect the required tools and raw materials.
- 9.2 Make the boards according to required size.
- 9.3 Erect the boards and attached accordingly so that they can easily remove.
- 9.4 Check the dimensions of the column/beam.
- 9.5 Disassemble the form works and store the materials used.

10. Perform white washing/ color washing/ distempering/ snowcem washing/ weather coating/ plastic emulsion painting on new/old surface.

- 10.1 Collect the required tools and raw materials.
- 10.2 Prepare the surface as necessary.
- 10.3 Prepare white wash as required.
- 10.4 Apply first coat of white wash and allow to drying.
- 10.5 Apply second coat of white wash and allow to drying.
- 10.6 Apply the final coat of white wash.

11. Perform varnishing on new and old wooden surface.

- 11.1 Collect required tools and raw materials.
- 11.2 Prepare the surface as necessary.
- 11.3 Prepare varnish as required.
- 11.4 Apply first coat and allow to drying.
- 11.5 Apply second coat and allow to drying.
- 11.6 Apply the final coat of varnish.

12. (a) Draw plan and sectional elevation of on irrigative and drainage canal.

(b) Prepare a typical model of a drainage canal with suitable materials.

13. (a) Draw plan and sectional elevation of a RCC bridge or culvert.

(b) Prepare a typical model of a RCC bridge with or culvert suitable materials.

14. Make a site visit/field trip.

15. Field visit for steel scaffolding for construction site.

REFERENCE BOOKS

- 1. Building Construction - B C Punmia
- 2. A Text Book of Construction - S P Aurora & S P Bindra
- 3. Building Construction - G J Kulkarni
- 4. Building Construction - S C Rangwala
- 5. Construction and Foundation Engineering - Dr. J Jha, S K Sinha
- 6. Building Construction

AIMS

- To be able to set out different types of curve.
- To be able to conduct sounding.
- To be able to learn using total station,
- To be able to perform city survey.

SHORT DESCRIPTION

Curve ranging; Setting out Plan/alignment; Hydrographic survey; Total station; City survey.

DETAIL DESCRIPTION**Theory:**

- 1.1 Understand the concept of curve and curve ranging.**
 - 1.2 Define curve and curve ranging.
 - 1.3 Classify different types of curve.
 - 1.4 Describe circular curve with nomenclature.
 - 1.5 Express the deduction of formula for finding radius of a circular curve.
 - 1.6 Express the deduction of formula for calculating different elements of simple curve.
 - 1.7 Classify different methods of curve ranging.
 - 1.8 Describe the procedure of finding out deflection angle.
 - 1.9 Explain the importance of peg interval.
 - 1.10 Solve problem on different elements of simple curve.
- 2. Understand the procedure of setting out curves by linear methods.**
 - 2.1 Classify setting out curve by linear method.
 - 2.2 Express the deduction of formula for setting out curve by ordinates from long chord.
 - 2.3 Describe the procedure of setting out curve by ordinates from long chord.
 - 2.4 Express the deduction of formula for setting out curve by offsets from tangent (radial method).
 - 2.5 Express the deduction of formula for setting out curve by offsets from tangent (perpendicular method).
 - 2.6 Solve problems on setting out of circular curves.
- 3. Understand the procedure of setting out curves by angular methods.**
 - 3.1 Describe the angular methods of curve ranging.
 - 3.2 Express the deduction of formula for setting out curve by one theodolite method
 - 3.3 Describe the procedure of setting out curve by one theodolite method.
 - 3.4 Describe the procedure of setting out curve by two-theodolite method.
 - 3.5 Solve problems on setting out curve by angular method.
- 4. Understand the concept of transition curve.**
 - 4.1 Describe transition curve.
 - 4.2 List the elements of transition curve.
 - 4.3 Mention the conditions of transition curve.

- 4.4 Classify different types of transition curve.
- 4.5 Express the deduction of formula for calculating super elevation.
- 4.6 Express the deduction of formula for calculating the length of transition curve as used in highways and railways.
- 4.7 Describe the necessity of shifting curve.
- 4.8 Describe the procedure of setting out transition curve by tangential angle method.
- 4.9 Solve problems on transition curves.

5. Understand the concept of vertical curve.

- 5.1 Describe vertical curve.
- 5.2 Classify different types of vertical curve with their purposes.
- 5.3 Explain the properties of parabola.
- 5.4 Describe the calculating process of setting out data for vertical curve.
- 5.5 Describe the procedure of finding out the grade of an undulated proposed road.
- 5.6 Describe the procedure of setting out vertical curves.
- 5.7 Solve problem on vertical curve.

6. Understand the concept of setting out plan of a building and alignment of a road.

- 6.1 Explain the significance of setting out a plan of a building and alignment of a road.
- 6.2 List the instrument and accessories required for setting out works for building and road alignment.
- 6.3 Describe the procedure of providing reduce levels on different parts of a building and road.

7. Understand the concept of route survey.

- 7.1 State the meaning of route survey.
- 7.2 Explain the series of work of route survey of a project.
- 7.3 Describe the reconnaissance survey of a project.
- 7.4 Describe the preliminary survey of a project.
- 7.5 List the instrument required for preliminary survey.
- 7.6 Name the different parties for preliminary survey and describe their works.
- 7.7 Describe the location survey of a project.
- 7.8 Describe the construction survey of a project.

8. Understand the procedure of sounding.

- 8.1 State the meaning of sounding.
- 8.2 Describe the duties of members of a sounding party.
- 8.3 Distinguish between shoreline and range line.
- 8.4 Describe various types sounding equipment.
- 8.5 Describe the procedure of measuring sounding.
- 8.6 Mention the methods of locating sounding.
- 8.7 Explain the reduction of sounding.
- 8.8 Solve problems on reduction of sounding.
- 8.9 Describe the process of plotting of sounding.
- 8.10 Describe the procedure of solving three points problem.

9. Understand the principles of operation and uses of total station.

- 9.1 Describe the components of total station.
- 9.2 Mention the uses of total station.

- 9.3 Describe the procedural steps of setting total station.
- 9.4 Name the fundamental lines of total station.
- 9.5 Mention the relation among the fundamental lines.
- 9.6 List different types of adjustment.
- 9.7 Describe the procedure of taking readings with total station.

10. Understand the principles of making traverse with total station.

- 10.1 List the fieldworks involved in survey with total station.
- 10.2 Describe the procedure of measuring horizontal distance and vertical height with total station.
- 10.3 Describe the operational steps of traverse survey with total station.
- 10.4 Compute the Gale's traverse with the help of total station.
- 10.5 Describe the plotting of map of a traverse survey with total station.

11. Understand the procedure of city survey.

- 11.1 Explain the purpose of city survey.
- 11.2 List the maps required for city survey.
- 11.3 Describe the methods of establishing horizontal and vertical control.
- 11.4 List the instrument required for city survey.
- 11.5 Describe the method of preparing topographic map of a city.
- 11.6 Explain the objects of the property survey of a city.
- 11.7 Describe the method of preparing property map of a city.
- 11.8 Describe the method of preparing wall map of a city.
- 11.9 Describe the method of preparing underground map of a city.

PRACTICAL:

- 1. Set out circular curve by offset from long chord method.
- 2. Set out circular curve by offset from tangent (radial method).
- 3. Set out circular curve by offset from tangent (perpendicular method).
- 4. Set out circular curve by one theodolite method (Rankin method).
- 5. Set out circular curve by two theodolite method.
- 6. Perform layout plan of a building using theodolite.
- 7. Perform layout alignment of a highway.
- 8. Perform river or canal cross section by sounding method.
- 9. Demonstrate the components and use of Total Station.
- 10. Determine the horizontal and vertical distances with total station.
- 11. Conduct traversing with a total station and plot map including computation of area.
- 12. Field visit

REFERENCE BOOKS

- 1 Surveying and leveling - T P Kanetkar
- 2 Surveying - Norman Thomas

AIMS

- To enable to select suitable methods for collection and distribution of water from given source to given community.
- To enable to identify impurities of water of given sources and selected suitable method/methods of purification up to potable standard.
- To assist in comparing various types of water pipes and pipe fittings.
- To develop understanding of the procedure of construction, repair, replacement and maintenance of water supply systems.
- To provide understanding of the socio-economic aspect of water supply and sanitation (WSS).

SHORT DESCRIPTION

Introduction; Water requirements; Sources of water; Water pipes; Collection and transmission of water; Quality of water; Treatment of water (clarification); Treatment of water (filtration); Treatment of water (disinfection and softening); Miscellaneous water treatment; Water distribution; Water reservoir; Distribution system; Rural water supply system; Plumbing system.

DETAIL DESCRIPTION**Theory:****1. Understand the concept of water supply engineering.**

- 1.1 Define water supply engineering.
- 1.2 Explain the scope of water supply engineering.
- 1.3 Describe the importance and necessity of planned water supply.
- 1.4 Describe the water supply and its impact on public health and environment.
- 1.5 Explain the components of water supply system (Rural and Urban).

2. Understand the various aspects of consumption of water.

- 2.1 Describe population prediction and various methods of population forecast.
- 2.2 Describe the various needs for clean water and list the quantities required for those purposes.
- 2.3 Explain the influence of the factors which affect per capita consumption of water:
 - a. Size of city
 - b. Characteristics of population
 - c. Industries and commercial organization
 - d. Climatic condition
 - e. Metering of water
- 2.4 Explain the demand of water for fire fighting and fire stand post.

3. Understand the different sources of water.

- 3.1 Identify different sources of water.
- 3.2 Explain the hydrological cycle.
- 3.3 State the advantages and disadvantages of ground water.
- 3.4 Mention the advantages and disadvantages of surface water.
- 3.5 Distinguish between the ground water supply and surface water supply in respect to quality of water.
- 3.6 Explain rainwater harvesting

4. Understand the different type of pipes & pipe joints used in water supply and the reasons for corrosion in metal pipes.

- 4.1 Classify the different type of pipes according to size, materials, quality, and allowable stresses used in Bangladesh.
- 4.2 Explain the causes of corrosion of metal pipes.
- 4.3 Describe the methods of prevention and protection against corrosion.
- 4.4 Explain the causes of deterioration in non-metal pipes.
- 4.5 Describe with sketches the different joints used in pipes.
- 4.6 Describe with sketches the fittings of pipes and valves used.

5. Understand the collection and transmission system of water.

- 5.1 Identify the different types of intake used in collecting surface water.
- 5.2 Describe the different intake systems with sketches.
- 5.3 Classify the different type of pumps used in water supply.
- 5.4 Explain the uses and limitations of different type of pumps.
- 5.5 Distinguish between turbine pump and submersible pump used in deep tube well.

6. Understand the safe water and various types of impurities in water.

- 6.1 Define safe water
- 6.2 Mention the common water borne diseases.
- 6.3 Describe the contamination of water due to cross connection and plumbing defects, storage and back syphonage.
- 6.4 State the different type of impurities present in water.
- 6.5 Explain the causes of turbidity, color, taste and odor in water.
- 6.6 Mention the effects and maximum allowable limits (WHO & BSTI) of impurities (pH, colour, Turbidity, TDS, SS, Hardness, chloride, Nitrate, Iron, Sodium, Arsenic, Cadmium, lead, total coliform and faecal coliform) in water.
- 6.7 Explain the causes and effects of alkalinity, acidity and hardness in water.
- 6.8 Describe the effects of gaseous impurities (carbon di-oxide, hydrogen sulphide, dissolved oxygen) in water.
- 6.9 Mention the causes and effects of nitrate (methemoglobinemia) and lead poisoning (plumbism) in water.

7. Understand the treatment of water by clarification.

- 7.1 Explain a typical flow diagram of treatment plant units.
- 7.2 Outline the need of screening of water.
- 7.3 Mention the principle of plain sedimentation.
- 7.4 Mention the principle of sedimentation with coagulation.
- 7.5 State different types of coagulants with their purpose and action.
- 7.6 Describe the process of flocculation.
- 7.7 Describe a typical sketch of sedimentation tank.

8. Understand the treatment of water by filtration.

- 8.1 Explain the need of filtration of water.
- 8.2 State the theory of filtration of water for bacteriological removal.
- 8.3 Explain the characteristics between the slow sand filter and rapid sand filter.
- 8.4 Describe the operation difficulties of slow sand and rapid sand filters.
- 8.5 State the meaning of negative head and mud balls.

9. Understand the treatment of water by disinfection and softening.

- 9.1 Describe disinfection of water by chlorination.
- 9.2 Explain the advantages and limitations of disinfection of water by chlorination.
- 9.3 Compare the pre-chlorination, post chlorination, double chlorination and super chlorination.
- 9.4 Explain the advantages of break point chlorination.
- 9.5 Describe the following methods of disinfection of water:
 - a. Heating and boiling
 - b. pH control
 - c. Using oxidizing agent
 - d. Ultra violet Ray
 - e. Ozone
- 9.6 Distinguish between hard and soft water.
- 9.7 List different processes of water softening.

10. Understand the different processes of removing color, odor, taste, arsenic, iron, manganese and salinity.

- 10.1 Explain the purpose of aeration.
- 10.2 Describe the different methods of aeration.
- 10.3 Describe the process of removal of color, odor and taste by activated carbon.
- 10.4 Explain the different methods of removing arsenic, iron and manganese with flow diagram.
- 10.5 List the different methods of desalination of water.

11. Understand the different water distribution methods, construction and maintenance.

- 11.1 State the different features of the distribution systems.
- 11.2 Describe with the help of sketches the different methods of supply of water.
- 11.3 Outline the advantages and disadvantages of different methods of supply of water.
- 11.4 Describe with sketches the different layout methods of distribution pipes.
- 11.5 Explain the relative advantages and disadvantages of different layout methods of distribution pipes.
- 11.6 State the different types of-
 - a. Meter
 - b. Valves
 - c. Fire hydrant
 - d. Pipe & Fittings.
- 11.7 Describe the procedure of excavation and back filling for laying pipe lines.
- 11.8 Describe the procedure for-
 - a. handling and laying pipes and their maintenance
 - b. placing and maintenance of hydrants and valves
 - c. cleaning of water mains and use of washout system.

12. Understand different types of reservoir.

- 12.1 Mention the different types of reservoir according to position and shape.
- 12.2 Explain the needs of roof tank and typical water reservoir in a building.
- 12.3 Describe the typical section of roof tank and water reservoir in a building.

13. Understand the water supply systems with specific reference to rural Bangladesh

- 13.1 Give introduction to different types of hand pumps: No. 6 hand pump, deep-set (Tara) pump.

- 13.2 Describe the procedure of drilling, aquifer selection, back filling and installation techniques including developing of new tube well.
- 13.3 Explain the design procedure of tube well strainer.
- 13.4 Describe operation & maintenance of No. 6 hand pumps and deep-set (Tara) hand Pumps.
- 13.5 Explain the drilling problems in rocky areas.
- 13.6 Give introduction to alternative technologies in problem areas of Bangladesh: Shallow Shrouded Tube well (SST), Very Shallow Shrouded Tube well (VSST), Pond Sand Filter (PSF), Infiltration Galleries (IG), Iron Removal Unit (IRU) and Deep-set technologies.

14. Understand the importance of plumbing system.

- 14.1 Define plumbing system.
 - 14.1.1 List the requirements of plumbing installation.
 - 14.1.2 Identify with sketches the various plumbing fittings and fixtures.
 - 14.1.3 Describe the uses of various plumbing fittings and fixtures.
 - 14.1.4 Differentiate between plumbing fittings and fixtures.
 - 14.1.5 List the tools required for plumbing works.
 - 14.1.6 Mention the uses and maintenance of various plumbing tools.

15. Understand the effect of socio-economic factors on water supply and sanitation.

- 15.1.1 Describe the socio-economy of rural and urban area in Bangladesh.
- 15.1.2 Give definitions of demographic characteristics, power structure, cultural Issues (traits), rural leadership and local government structure.
- 15.1.3 Describe the influence of socio-economic aspects on community water Supply and sanitation.

PRACTICAL:

1. Identification of pipes and fittings.

- 1.1 Identify physically different type of pipes, fittings and joints.
- 1.2 Draw the sketches of typical plumbing fittings.
- 1.3 Cut pipes and cut a thread on the pipe.
- 1.4 Inspect installations to identify good and poor quality materials and workmanship

2. Demonstration of water purification plant and deep tube well.

- 2.1 Draw flow diagram of water purification processes after visiting a plant.
- 2.2 Draw section through a deep tube well.
- 2.3 Identify the major precautions needed during installation and use of deep tube well.

3. Maintenance works.

- 3.1 Identify, take out and replace unserviceable fixtures/ fittings or any other component parts.
- 3.2 Identify the common troubles of submersible pump and their solutions after visiting pump house.
- 3.3 Identify the common troubles in water supply pipe lines and their solution by visiting concern authorities (WASA, City Corporation and Pourashava).

4. Conduct physical and chemical tests of water.

- 4.1 Conduct physical tests of water (pH value & turbidity) using field pH and turbidity meter.
- 4.2 Conduct chemical tests of water (iron, manganese and chloride) using field kits.
- 4.3 Conduct the arsenic test of water using field kits.
- 4.4 Conduct residual chlorine test using field kits.
- 4.5 Conduct hardness test using field kits.

5. Physically identify different parts of

- a) No. 6 hand pump,
- b) Deep-set (Tara) hand pumps.
- c) Submersible pump

6. Inspect installation of

- a) No. 6 hand pump,
- b) Deep-set (Tara) hand pumps.
- c) Submersible pump

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1. Rangawala, S.C(2009): Water supply and sanitation. (Environmental Engineering)
2. Azizul, Syed Haq (2006): Plumbing Practices.
3. Feroze, M. Ahmed & Mujibur, M. Rahman (2000): Water Supply & Sanitation: Rural And Low Income Urban Communities, ITN-Bangladesh Publication.
4. Plumbing (1991): Technical Teachers Training College Publication.
5. Aziz, M.A (1975) : Water supply and sanitation.

AIMS

- To be able to consolidate and extend the fundamental understanding of the behavior of statically determinate structures i.e. beams, frames etc.
- To be able to develop awareness of structural behavior such as deflection and stability of masonry dam.
- To be able to develop understanding for selection of suitable section of beam and member of the truss.

SHORT DESCRIPTION

Shear force and bending moment of beams; Stresses in beams; Deflection of beams; Joints and connections; Forces in frames; Steel structure; Masonry dam; Column; Moving loads; Thin Cylindrical shells.

DETAIL DESCRIPTION**Theory:****1. Understand shear force and bending moment of beams.**

- 1.1 Define determinate, indeterminate and homogeneous structure.
- 1.2 Mention different types of support condition.
- 1.3 Explain the relations between shear force and bending moment.
- 1.4 Define dangerous section and point of contra flexure.
- 1.5 Solve problems on SF and BM of cantilever beam with concentrated load, distributed load, inclined load and combined loads.
- 1.6 Solve problems on SF and BM of simply supported beam with concentrated load, distributed load, inclined load and combined loads.
- 1.7 Solve problems on SF and BM of overhanging beam with concentrated load, distributed load, inclined load and combined loads.

2. Understand the bending stresses in beams.

- 2.1 State the meaning of bending stresses in beam.
- 2.2 List the assumptions of bending stresses in beam.
- 2.3 Differentiate between bending moment and bending stress.
- 2.4 Express and derivation of the formula for bending stress.
- 2.5 State the meaning of elastic section modulus.
- 2.6 Solve problems on section modulus of circular, rectangular, I, T, L and hollow sections of beams.
- 2.7 Solve problems on bending stresses of circular, rectangular, I, T, L and hollow sections of beams.

3. Understand the shearing stresses in beams.

- 3.1 State the meaning of shearing stresses in beam
- 3.2 Differentiate between maximum and average shear stress.
- 3.3 Relate maximum shear stress and average shear stress for rectangular, circular and triangular section.
- 3.4 Express the derivation of the formula for shearing stress.
- 3.5 Solve problems on shearing stresses of circular, rectangular, I, T, L and hollow sections of beams.
- 3.6 Determine the section of homogeneous beam with respect to shearing stress and bending stress.

4. Understand the deflection of beams.

- 4.1 Define the meaning of deflection of beam and elastic curve.
- 4.2 List the assumptions of deflection of beam.
- 4.3 State the maximum allowable deflection for RCC beam, RCC slab and steel beam.
- 4.4 Express the derivation of equation for elastic curve
- 4.5 State the 1st and 2nd area moment proposition.
- 4.6 Compute the slope of elastic curve for cantilever beam with concentrated and distributed load.
- 4.7 Compute the maximum deflection for cantilever beam with concentrated and distributed load.
- 4.8 Compute the slope of elastic curve for simply supported beam with symmetrically concentrated and distributed load.
- 4.9 Compute the maximum deflection for simply supported beam with symmetrically concentrated and distributed load.

5. Understand the concept of steel structure and joints.

- 5.1 Define steel structure.
- 5.2 Describe joint and connections of steel structure.
- 5.3 State the differences between cold rolled and build up section.
- 5.4 Name the elements of pre-fabricated building.
- 5.5 Define pitch, back pitch and repeating section.
- 5.6 State the necessity of joints.
- 5.7 Classify joints and state efficiency of joints.
- 5.8 Explain the modes of failure and remedial measures of riveted joints.
- 5.9 Solve problems on simple lap joint and butt joint subjected to axial load only.

6. Understand the significance of welded connections.

- 6.1 Define terms: Fillet, Leg, Throat.
- 6.2 State the significance of welded connections.
- 6.3 Classify different types of welded connections.
- 6.4 Mention the merits and demerits of welded connections.
- 6.5 Solve problems on fillet weld connection subjected to axial load only.
- 6.6 Solve problems on butt weld connection subjected to axial load only.

7. Understand the action of forces in steel frames.

- 7.1 Define the terms: truss, tie, strut, redundant, deficient, web and chord member, perfect, imperfect frame.
- 7.2 Mention different types of roof trusses, bridge trusses and beams.
- 7.3 State the fundamental assumptions in trusses.
- 7.4 Describe the methods of computing forces in trusses.
- 7.5 Determine the forces on frames for warren truss, cantilever and Howe truss with dead load by Analytical (joint and moment) method.
- 7.6 Determine the forces on frames for warren truss, cantilever and Howe truss with dead load by graphical method.

8. Understand the stability of masonry dam.

- 8.1 Define dam and mention the functions of a dam.
- 8.2 Mention the different types of dam.
- 8.3 Explain the stability of a masonry dam.
- 8.4 State the meaning of middle third law.
- 8.5 Express the derivation of the equation for minimum width of the base for just no tension.

- 8.6 Calculate the maximum and minimum pressure on the foundation bed for rectangular dam
- 8.7 Calculate the maximum and minimum pressure on the foundation bed for trapezoidal dam having water face vertical only.
- 8.8 Solve problems on stability of the dam.

9. Understand the elastic buckling of columns.

- 9.1 State the meaning of short and long column.
- 9.2 Mention the type of columns on the basis of end conditions.
- 9.3 Compare the equivalent length of different columns.
- 9.4 Interpret the Euler's formula for flexural buckling of a pin ended strut/column.
- 9.5 Calculate the safe load on column using Euler's formula.
- 9.6 State the Rankin-Gordon formula.
- 9.7 Calculate the safe load on column using Rankin-Gordon formula.

10. Understand the concept of moving loads.

- 10.1 State the meaning of moving load.
- 10.2 Classify different types of moving loads.
- 10.3 State the meaning of influence line.
- 10.4 Draw influence line for single concentrated load and reaction of a simply supported beam.

11. Understand the concept of Thin Cylindrical Shells.

- 11.1 Define cylindrical shell.
- 11.2 Failure of a cylindrical shell due to an internal pressure.
- 11.3 Stresses in a thin cylindrical shell.
- 11.4 Circumferential stress.
- 11.5 Longitudinal stresses.
- 11.6 Design of thin cylindrical shells

PRACTICAL:

1. Determine shear force & bending moment at different sections of simply supported beam with different types of load and draw the diagrams.
2. Determine shear force & bending moment at different sections of overhanging beam with different types of load and draw the diagrams.
3. Determine the position of dangerous section and inflection point or point of contra flexure of overhanging beam and show in diagram.
4. Determine the bending stresses of circular, rectangular & hollow sections of beams and draw the diagrams.
5. Determine the bending stresses of I, T, L sections of beams and draw the diagrams.
6. Determine the shearing stresses of circular and rectangular sections of beams and draw the diagrams.
7. Determine the shearing stresses of I & T sections of beams and draw the diagrams.
8. Determine the section of homogeneous beam with respect to shearing stress and bending stress.
9. Determine the deflection of cantilever and simply supported beam with respect to concentrated/distributed load.
10. Draw the neat sketches of different type of riveted joints showing the mode of failures.
11. Determine the forces developed on the member of a truss graphically.
12. Prepare some models of different types of truss with suitable materials.
13. Draw a sketch of a pre-fabricated building and show the different elements in the figure.

REFERENCE BOOKS

1. Theory of simple structure – T C Shed and J Vawter
2. Strength of materials and structures – J Case and A H Chilver
3. Theory of structures – R S Khurmi
4. Strength of Materials – R S Khurmi
5. Steel Structure – Gay Lord

AIMS

- To be able to understand the estimating of framed structure multi-storied building.
- To be able to understand the estimating of roof truss, bridge & culvert and deep tube well.
- To be able in preparation of the specification and tender documents of civil engineering works.
- To be able to understand the public works account and forms.
- To be able to improve knowledge and skill of rate analysis process for different items of work in building construction as per PWD standard.
- To be able to understand the valuation property and building.

SHORT DESCRIPTION

Estimate of multi-storied framed structure building i/c Sanitary works; Culvert & Bridge; Reinforced cement concrete retaining wall; Roof truss; Steel Structure; Deep tube well; Preliminary estimate for building project work according to plinth area rate; Rate analysis and valuation of property. Bar schedule of beam, column, one way & two way slab.

DETAIL DESCRIPTION**Theory:****1. Understand the components and item of works of Multi- storied framed structure building.**

- 1.1 Define framed structure building.
- 1.2 Define substructure and superstructure of a building.
- 1.3 Differentiate between structural and non-structural member in a framed structure building.

2. Understand the earth work, brick flat soling and cement concrete in foundation and plinth.

- 2.1 State the way of calculating earth work in excavation for foundation trenches.
- 2.2 State the way of calculating earth work in filling of foundation trenches.
- 2.3 State the way of calculating earth work in filling plinth for rooms and verandah.
- 2.4 State the way of calculating brick flat soling in foundation and floors.
- 2.5 State the way of calculating mass concrete work in foundation and floors.

3. Understand the reinforced cement concrete work in different items of building

- 3.1 State the method of calculating R.C.C work in different types of column with footing. (i.e. square, L-shaped, T- shaped, I-shaped and circular section column with block and sloped spread footings and quantity of reinforcement i/c bar schedule and formworks.
- 3.2 State the method of calculating quantity of R.C.C work and reinforcement (i/c bar schedule), formworks for R.C.C work in all types of beam, lintel, one way and two way slab, cantilever and porch slab.
- 3.3 State the method of calculating R.C.C work in sun shed, shelves, railing, drop wall, etc.
- 3.4 State the method of calculating R.C.C work in stair and quantity of reinforcement i/c bar schedule and formworks.

4. Understand the brick work and cement plaster work in foundation and superstructure.

- 4.1 Mention the unit of brick work (half having half brick thick wall) in partition walls.
- 4.2 State the method of calculating cement plaster work on inner side and outer side of brick wall.

4.3 State the method of calculating cement plaster work over reinforced cement concrete surfaces such as: column, lintel, beam, ceiling, sun shed, shelve, railing, drop wall, fins or louvers and stair etc.

5. Understand the wood work in different types of doors and windows with grill works.

5.1 Mention the unit of wood works in door and window shutters.

5.2 State the method of calculating wood work in door frames.

5.3 State the method of calculating wood work in door shutters.

5.4 State the method of calculating wood work in window frames.

5.5 State the method of calculating wood work in window shutters.

5.6 State the method of calculating the steel/aluminum frame and shutters of doors and windows i/c glass fiber shutter.

5.7 Mention the unit of grill works.

5.8 Calculate grill works in window and verandah.

5.9 Calculate the quantity of M.S, S.S, Aluminum bar etc. for grill/frame work as per detail drawing.

6. Understand the patent stone flooring, mosaic work, tiles & skirting.

6.1 State the method of calculating patent stone flooring.

6.2 State the method of calculating tiles work in floor and wall.

6.3 State the method of calculating mosaic work on floor.

6.4 State the method of calculating skirting work.

6.5 Calculate the quantity of floor tiles, wall tiles and mosaic work.

7. Understand the lime terracing work over RCC roof slab.

7.1 State the method of calculating lime terracing work.

7.2 List the materials required for lime terracing work.

7.3 Calculate the quantity of lime terracing work.

8. Understand the surface finishing works of building.

8.1 State the method of calculating white wash (inside only) and color wash (outside only).

8.2 State the method of calculating wall and ceiling paper.

8.3 State the method of calculating distemper (inside only).

8.4 State the method of calculating plastic emulsion paint (inside only).

8.5 State the method of calculating snowcem wash and weather coat (outside only).

8.6 State the method of calculating synthetic enamel paint to doors and windows.

8.7 State the method of calculating synthetic enamel paint to grills.

8.8 State the method of calculating synthetic enamel paint to skirting.

8.9 State the method of calculating varnishing / French polish to wooden doors and windows.

9. Understand the estimate of septic tank.

9.1 State the different items of work in septic tank and soak well.

9.2 State the way of calculating earth work in excavation for septic tank and soak well.

9.3 State the method of calculating brick work in septic tank and soak well.

9.4 State the method of calculating RCC and CC work in septic tank and soak well.

9.5 State the method of calculating cement plaster work in septic tank and soak well.

9.7 Calculate the different items of work in septic tank and soak well.

10. Understand the estimate of RCC retaining wall and RCC culvert.

10.1 State the way of calculating earth work in excavation for foundation trenches of RCC retaining wall.

10.2 State the method of calculating mass concrete and RCC work in RCC retaining wall.

- 10.3 State the method of calculating back filling work in RCC retaining wall.
- 10.4 State the method of calculating and make bar schedule of M.S bar.
- 10.5 State the way of calculating earth work in excavation for foundation trenches of culvert.
- 10.6 State the method of calculating brick work, mass concrete and RCC work in culvert.
- 10.7 State the method of calculating cement plaster work in culvert.
- 10.8 State the method of calculating earth filling work in culvert.

11. Understand the estimate of roof truss (wooden & steel).

- 11.1 State the different items of work of roof truss.
- 11.2 State the way of calculating the quantities of wood required in a roof truss.
- 11.3 State the way of calculating the quantities of steel required in a roof truss.
- 11.4 Mention the standard lapping at end & sides of CI sheet for roofing.
- 11.5 State the way of calculating the quantities of CI sheet for roof covering.
- 11.6 State the way of calculating the quantities of GI ridging.
- 11.7 State the way of calculating the painting works of roof truss.
- 11.8 Calculate the different items of work of wooden roof truss.
- 11.9 Calculate the different items of work of steel roof truss.

12. Understand the estimation of steel structure (vertical iron column).

- 12.1 Identify the different components and accessories of steel structure.
- 12.2 State the way of calculating the quantities of steel (iron) required in steel structure.
- 12.3 State the way of calculating the quantities of gusset plate, bolts and nuts used in steel structure.
- 12.4 State the way of calculating the painting work of steel structure.

13. Understand the estimation of plumbing and sanitary works.

- 13.1 State the method of estimate plumbing and sanitary works.
- 13.2 Name the different fittings and fixtures required for water supply and sanitary works
- 13.3 Describe the method of estimation the drainage works of a buildings.

14. Understanding the process of analysis of rates of various items of work as per PWD standard.

- 14.1 State the requirements of rate analysis.
- 14.2 Mention the important factors that affect the analysis of rates.
- 14.3 Describe the procedure of rate analysis to calculate the rate per unit of the item of works.
- 14.4 List the quantity of materials and the number of different categories of labour required for the following item of work and analysis the unit rate i/c contractors profit, tools and plants (T&P) over head expenses, income tax (IT) and value added tax (VAT) as per PWD standard.
 - a. Earth work in excavation for foundation trenches.
 - b. Earth and sand filling in foundation and plinth.
 - c. One layer brick flat soling in foundation and floor.
 - d. Cement concrete work (1:3:6) in foundation and floor.
 - e. Brick work in foundation up to plinth with 1:6 cement mortar.
 - f. 75 mm thick damp proof course (DPC) in proportion 1 :1.5: 3.
 - g. Brick work of 250 mm & above thick wall in superstructure with 1:6 cement mortar.
 - h. Brick work of 125mm thick wall in superstructure with 1:4 cement mortar.
 - i. RCC work in proportion 1:2:4 and 1:1.5:3 i/c shuttering cost (footing, grade beam, column below & above plinth, lintel & tie beam, roof beam, roof slab, Sun shade, railings, drop wall, shelves, parapet & stair slab etc.

- j. Mild steel reinforcement fabrication work in different types of RCC work for one quintal of work.
- k. Patent stone flooring in proportion 1:1.5:3 with neat cement finish.
- l. Average 12 mm thick cement plaster (1:6) to brick walls.
- m. Average 6 mm thick cement plaster (1:4) to RCC surface.
- n. Lime terracing work with proportion of 2:2:7 over roof slab.
- o. Teak wooden door frame and 38 mm thick paneled door shutter.
- p. Aluminum swing and sliding door and window.
- q. Steel glazed window shutter with Z- section, T- section, FI bars etc.
- r. White washing, color washing, distempering, snowcem washing, plastic emulsion paint, synthetic enamel paint wherever necessary.
- s. Installation of European type commode & Indian type long pan (WC) with low level flushing tank, bath tub, wash hand basin, sink, squatting & standing urinals.

15. Understand the preliminary estimate for building project work according to plinth area rate.

- 15.1 State the meaning of preliminary estimate.
- 15.2 Mention the basis of calculating preliminary cost estimate of a building project work.
- 15.3 Describe the calculation procedure of preliminary cost estimate for building project work according to plinth area rate.

16. Understand the public works account and forms.

- 16.1 Name different methods of carrying out works.
- 16.2 Explain imprested account.
- 16.3 Describe the master roll part-I and part-II.
- 16.4 Describe the measurement book (MB).
- 16.5 Define bill and voucher.
- 16.6 Define running & final bill.
- 16.7 Describe the mode of payment.
- 16.8 Mention the duties of Sub-Assistant Engineer.
- 16.9 Describe PPA - 2008.

17. Understand valuation of property and building.

- 17.1 State the meaning of valuation of property.
- 17.2 Mention the necessity of valuation.
- 17.3 Define the following terms:
 - a. Outgoings (Taxes, Repairs, Management and collection charges, sinking fund, loss and rent, Miscellaneous.)
 - b. Municipal taxes.
 - c. Scrap value.
 - d. Salvage value.
 - e. Market value.
 - f. Book value.
 - g. Rateable value.
 - h. Obsolescence.
 - i. Annuity.
 - j. Capital cost.
 - k. Capitalized value.
 - l. Years purchase (YP).
 - m. Sinking funds

- 17.4 Define the term valuation of building.
- 17.5 Describe the process to determine the cost of construction of a building.
- 17.6 Describe the process of valuation of a building.
- 17.7 Solve the problems related to a building from given data.

PRACTICAL:

1. Estimate the earth work in excavation and earth filling for foundation trenches.

- 1.1 Select a drawing of a two-storied framed structure building.
- 1.2 Determine the length, breadth & height of foundation trenches of columns and bottom of grade beam (if necessary) & verandah walls.
- 1.3 Calculate the quantity of earthwork in excavation in foundation trenches.
- 1.4 Determine the length, breadth & height of filling in plinth.
- 1.5 Calculate the quantity of earth work in filling plinth.
- 1.6 Calculate the quantity of earth work in filling the sides of column foundation trenches & sides of grade beam (if necessary).

2. Estimate the brick flat soling & mass concrete in foundation and floor.

- 2.1 Determine the length & breadth for brick flat soling in foundation and floor.
- 2.2 Calculate the total quantity of brick flat soling in foundation and floor.
- 2.3 Determine the length, breadth & thickness of mass concrete in foundation and floor.
- 2.4 Calculate the total quantity of mass concrete in foundation and floor.

3. Estimate the reinforced cement concrete work in foundation up to plinth level.

- 3.1 Determine the length, breadth & thickness of column footing.
- 3.2 Calculate the quantity of RCC work in column footing.
- 3.3 Determine the length, breadth & height of column up to plinth level.
- 3.4 Calculate the quantity of RCC work in column up to plinth level.
- 3.5 Determine the length, breadth & depth of grade beam.
- 3.6 Calculate the quantity of RCC work in grade beam.

4. Estimate the reinforced cement concrete work in superstructure.

- 4.1 Determine the length, breadth & height of column, lintel, beam, floor slab/roof sunshed, shelve, railing, drop wall, fins or louvers, stair slab, steps, beam, landing slab in each floor.
- 4.2 Calculate the quantity of RCC work in column in each floor.
- 4.3 Calculate the quantity of RCC work in lintel in each floor.
- 4.4 Calculate the quantity of RCC work in beam in each floor.
- 4.5 Calculate the quantity of RCC work in sunshed, shelve, railing, drop wall, fins or louvers in each floor.
- 4.6 Calculate the quantity of RCC work in stair slab, steps, beam, landing slab in each floor.
- 4.7 Calculate the quantity of reinforcement in different items building with bar schedule.

5. Estimate the brick work in sub-structure (foundation up to plinth level) and superstructure.

- 5.1 Determine the length, breadth & height of brick walls up to plinth level.
- 5.2 Calculate the quantity of brick work in sub-structure.
- 5.3 Determine the length & height of one brick thick walls in superstructure in each floor.
- 5.4 Calculate the quantity of brick work (one brick thick wall) in super structure in each floor (cum).
- 5.5 Determine the length & height of partition wall (half brick thick wall) in super structure in each floor.
- 5.6 Calculate the quantity of brick work (half brick thick wall) in super structure in each floor (sqm).
- 5.7 Calculate the quantity of curtain wall of a high rise building i/c all accessories with aluminum frame.

6. Estimate the cement plaster work on brick walls and RCC surfaces.

- 6.1 Determine the length & height of brick walls (inner side, outer side).
- 6.2 Calculate the quantity of cement plaster on brick walls (inner side, outer side).
- 6.3 Calculate the quantity of deduction for doors, windows and verandah opening.
- 6.4 Calculate the total quantity of cement plaster on brick walls.
- 6.5 Determine the height & breadth of RCC columns, lintels, beams, ceiling, sunshed, shelve, railing, drop wall, fins or louver (both sides), soffit in stairs & bottom surface of landing slab.
- 6.6 Calculate the quantity of cement plaster on RCC columns.
- 6.7 Calculate the quantity of cement plaster on RCC lintels/beams.
- 6.8 Calculate the quantity of cement plaster to RCC ceiling.
- 6.9 Calculate the quantity of cement plaster to RCC stair case.

7. Estimate the wood and steel work in door and window frames and shutters.

- 7.1 Identify the different sizes of doors and windows.
- 7.2 Determine the length & sizes of doors and windows (wooden, steel / aluminum) frames.
- 7.3 Calculate the quantity of wood work in door and windows frames (cum).
- 7.4 Determine the breadth & height of door and windows shutters.
- 7.5 Calculate the quantity of door and windows shutters, wooden, steel and glass fiber. (sqm).

8. Estimate the grill works.

- 8.1 Identify the different sizes of windows.
- 8.2 Determine the breadth & height of window openings.
- 8.3 Calculate the quantity of grill works(sqm).
- 8.4 Determine the breadth & height of verandah openings.
- 8.5 Calculate the quantity of grill works(sqm).

9. Estimate the patent stone flooring, mosaic work, tiles & skirting.

- 9.1 Determine the length & breadth of rooms and verandah for patent stone flooring.
- 9.2 Calculate the quantity of patent stone flooring in each floor.
- 9.3 Determine the length & breadth of rooms for mosaic works.
- 9.4 Calculate the quantity of mosaic works in each floor.
- 9.5 Determine the length & breadth of rooms for tiles work.
- 9.6 Determine the length & height of walls for tiles work.
- 9.7 Calculate the quantity of tiles work in each floor.
- 9.8 Determine the length & height of walls for skirting works.
- 9.9 Calculate the quantity of skirting works in each floor.

10. Estimate the lime terracing over RCC roof slab.

- 10.1 Determine the length, breadth & thickness of lime terracing.
- 10.2 Calculate the quantity of lime terracing.
- 10.3 Find out the quantity of each material required for lime terracing.

11. Estimate the quantity of white wash, color wash, snowcem wash, distemper, plastic paint where necessary.

- 11.1 Determine the length & breadth or height of walls and ceiling.
- 11.2 Calculate the quantity of area for white washing.
- 11.3 Determine the length & height of outside walls for color wash.
- 11.4 Calculate the quantity of area for color washing.
- 11.5 Determine the length & height of outside walls for snowcem wash.
- 11.6 Calculate the quantity of area for snowcem washing.

- 11.7 Determine the length & breadth or height of walls and ceiling.
- 11.8 Calculate the quantity of area for distempering.
- 11.9 Determine the length & breadth or height of walls and ceiling.
- 11.10 Calculate the quantity of area for plastic emulsion painting.

12. Estimate the painting and varnishing works to doors, windows, grills and skirting.

- 12.1 Identify the different sizes of doors, windows and grills.
- 12.2 Determine the length & height of each type of doors, windows and grills.
- 12.3 Calculate the quantity of area for painting and varnishing.
- 12.4 Determine the length & height of walls for skirting.
- 12.5 Calculate the quantity of area for skirting works.

13. Prepare an estimate of a septic tank and soak well with allied connections & fixtures.

- 13.1 Select a detail drawing of septic tank and soak well for 100 users.
- 13.2 Determine the necessary dimensions for detail estimate.
- 13.3 Estimate the different items of work of septic tank and soak well such as earth work in excavation & filling, brick flat soling, CC & RCC in base & top slab, brick works, cement plaster, patent stone flooring including all fittings.

14. Prepare an estimate of a RCC slab culvert and two span box culverts.

- 14.1 Select a detail drawing of RCC slab culvert and two span box culverts.
- 14.2 Determine the length, breadth & height or thickness of different members of the RCC slab culvert and two span box culvert.
- 14.3 Estimate the different items of work of RCC slab culvert and two span box culvert such as earth work in excavation & filling, brick flat soling, CC & RCC in base & top slab, brick works, cement plaster etc.

15. Prepare an estimate of a RCC retaining wall.

- 15.1 Select a detail drawing of a RCC retaining wall.
- 15.2 Determine the length, breadth & height or thickness of stem and base of the retaining wall.
- 15.3 Estimate the quantity of RCC work in stem and base of retaining wall.
- 15.4 Determine the measurement of reinforcement of the retaining wall.
- 15.5 Calculate the quantity of reinforcement required for the retaining wall.

16. Prepare an estimate of a wooden truss with CI sheet roofing.

- 16.1 Select a detail drawing of a king post roof truss.
- 16.2 Determine the length & sizes of different members of the truss.
- 16.3 Calculate the quantity of wood required for the truss in cum.
- 16.4 Determine the measurements of roofing area of the truss.
- 16.5 Calculate the quantity of CI sheet roofing in bundle / sqm.
- 16.6 Calculate the quantity of GI ridging in rm.
- 16.7 Calculate the quantity of painting works of the truss.

17. Prepare an estimate of a steel truss with CI sheet roofing.

- 17.1 Select a detail drawing of a steel truss.
- 17.2 Identify the length, sizes & thickness of different members of the truss.
- 17.3 Determine the measurements of each of the member of the truss.
- 17.4 Calculate the total quantity of steel required in kilogram/quintal/ton.
- 17.5 Determine the measurements of roofing area of the truss.
- 17.6 Calculate the quantity of CI sheet roofing in bundle / sqm.

17.7 Calculate the quantity of GI ridging in rm.

17.8 Calculate the quantity of painting works of the steel truss.

18. Prepare the cost of abstract of wooden & steel roof truss.

18.1 Identify the local rate of timber & other materials and labours for wooden truss.

18.2 List the items of work of a wooden truss.

18.3 Calculate the cost of abstract for wooden truss as per present market rate.

18.4 Identify the local rate of steel & other materials and labours for steel truss.

18.5 List the items of work of a steel truss.

18.6 Calculate the cost of abstract for steel truss as per present market rate.

19. Prepare an estimate of a steel structure.

19.1 Select a detail drawing of a steel structure.

19.2 Identify the length, sizes & thickness of different members of the steel structure.

19.3 Determine the measurements of each of the member of the steel structure.

19.4 Calculate the total quantity of steel required in kilogram/quintal/ton.

19.5 Calculate the quantity of painting works of the steel structure.

REFERENCE BOOKS

1. A Text Book of Estimating and Costing - by G S Birdie
2. Civil Estimating Quantity Surveying and Valuation - by Amarjit Agarwal
3. Estimating and Costing - by S C Rangwala
4. Estimating and Costing in civil engineering theory and practice - by B.N. Dutta
5. Tender documents of any building project prepared by Bangladesh Public Works Department (BPWD) or any other govt. organizations or any reputed civil engineering consulting firms in Bangladesh.

AIMS

- To enable to understand the behavior of incompressible fluids.
- To enable to understand the fundamentals of buoyancy.
- To enable to understand flow of liquid in closed system and in open channel.
- To assist in identifying the common measuring instruments / apparatus used in measuring the various parameters of flowing liquid.
- To enable to applying the common measuring instruments / apparatus in measuring the various parameters of flowing liquid.

SHORT DESCRIPTION

Fluid pressure; Buoyancy; Principles of flow of fluid; Flow through orifices and mouthpieces; Losses of head of flowing liquid; Friction and flow through pipes; Flow of liquid through notches and weirs; Flow of liquid through open channel; Measurement of velocity of flow by current-meter and float.

DETAIL DESCRIPTION**1. Understand the basic concept of fluid and its properties.**

- 1.1 Define fluid, liquid, gases, fluid mechanics and hydraulics.
- 1.2 Differentiate fluid, liquid and gases.
- 1.3 Define density of fluid and specific weight.
- 1.4 Mention the application of hydraulics.

2. Understand the aspects of fluid pressure.

- 2.1 State the meaning of intensity of pressure.
- 2.2 State the meaning of pressure head and static head of liquid.
- 2.3 Define free surface of liquid, atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.
- 2.4 Compute the intensity of pressure and total pressure at the base / side wall of a tank full of water.
- 2.5 Identify hydraulic ram and plunger.
- 2.6 Explain the working principle of a hydraulic ram.
- 2.7 Calculate the weight lifting capacity of ram.

3. Understand the technique of measuring the fluid pressure.

- 3.1 Define piezometer, manometer, differential manometer and inverted differential manometer.
- 3.2 Outline the specific uses and limitations of each of the fluid pressure measuring devices in 3.1.
- 3.3 Compute liquid pressure using piezometer.
- 3.4 Compute liquid pressure using simple manometer.
- 3.5 Compute difference of fluid pressure between two sections of a pipe line using differential manometer.
- 3.6 Compute difference of fluid pressure between two sections of a pipe line using inverted differential manometer.

4. Understand the concept of total pressure and center of pressure on immersed plane surface.

- 4.1 Explain total pressure and center of pressure on an immersed plane surface.
- 4.2 Explain total pressure and center of pressure on an immersed inclined plane surface.

- 4.3 Express the deduction of formula for computing total pressure and center of pressure on a vertically immersed plane surface.
- 4.4 Express the deduction of formula for computing center of pressure on an inclined immersed surface.
- 4.5 Compute total pressure and center of pressure on a vertically immersed plane surface.
- 4.6 Compute total pressure and center of pressure on an inclined immersed surface.

5. Understand the fundamental concepts of buoyancy.

- 5.1 Define buoyancy and center of buoyancy.
- 5.2 State metacentre and metacentric height.
- 5.3 Mention the conditions of equilibrium of a floating body.
- 5.4 Compute the metacentric height using experimental formula.

6. Understand the principles of flow of liquid under different conditions.

- 6.1 Define various types of flow such as: laminar flow, turbulent flow, steady flow, unsteady flow, uniform flow, non-uniform flow, incompressible flow, rotational flow, irrotational flow, continuous flow.
- 6.2 Explain the term discharge.
- 6.3 State the equation of continuity of liquid flow.
- 6.4 Explain datum head, velocity head, pressure head and total head of a liquid.

7. Understand the concept of Bernoulli's theorem.

- 7.1 State the Bernoulli's theorem.
- 7.2 Prove the Bernoulli's theorem.
- 7.3 Describe construction of venturimeter and pitot tube.
- 7.4 Compute the discharge in a given pipe line by using venturimeter.
- 7.5 Compute velocity and discharge in a section of a flowing liquid by using a pitot tube.

8. Understand the aspects of flow through orifice and mouthpiece.

- 8.1 Define the terms: orifice, jet of water and venacontracta.
- 8.2 State the meaning of coefficient of contraction (C_c), coefficient of velocity (C_v), coefficient of discharge (C_d).
- 8.3 State the relation between C_c , C_v and C_d .
- 8.4 Calculate the time of emptying a rectangular tank and hemispherical vessel through orifice.
- 8.5 Define the term mouthpiece.
- 8.6 Explain the functions of a mouthpiece.
- 8.7 Distinguish between external and internal mouthpieces.

9. Understand the aspects of different types of losses of head of flowing liquid.

- 9.1 Define loss of head of flowing fluid.
- 9.2 Explain different types of losses of head of flowing liquid such as:
 - a) Loss of head due to friction.
 - b) Loss of head due to bend and elbows.
 - c) Loss of head due to sudden enlargement.
 - d) Loss of head due to sudden contraction.
 - e) Loss of head at entrance to pipe.
 - f) Loss of head due to obstruction.
- 9.3 Calculate loss of head due to friction.

10. Understand the aspects of friction and flow through pipes.

- 10.1 Describe friction of fluid flowing through pipes.
- 10.2 State the Chezy's formula for loss of head due to friction in pipes.
- 10.3 State the Darcy's formula for loss of head due to friction in pipes.
- 10.4 Calculate the loss of head due to friction in pipes using Chezy's formula.
- 10.5 Calculate the loss of head due to friction in pipes using Dracy's formula.

11. Understand the principle of flow through notches.

- 11.1 Describe notch.
- 11.2 Identify different types of notches.
- 11.3 Outline the advantages of triangular notch over rectangular notch.
- 11.4 State the formulae for measuring discharges through rectangular notch, V-notch and trapezoidal notch.
- 11.5 Calculate the discharges through rectangular notch using discharge formulae.
- 11.6 Calculate the discharges through triangular notch using discharge formulae.
- 11.7 Calculate the discharges through trapezoidal notch using discharge formulae.

12. Understand the principle of flow through weirs.

- 12.1 Describe weir.
- 12.2 Outline the differences between weir and notch.
- 12.3 State Francis' formula for discharge through a rectangular weir.
- 12.4 State Bazin's formula for discharge through a rectangular weir.
- 12.5 Calculate the discharges through rectangular weir using Francis' formula.
- 12.6 Calculate the discharges through rectangular weir using Bazin's formula.

13. Understand the aspects of flow of liquid through open channel.

- 13.1 Describe open channel, wetted perimeter, hydraulic radius, Laminar and turbulent flow, Reynold's number, hydraulic jump, critical depth, Critical velocity and hydraulic gradient.
- 13.2 State the different types of open channels.
- 13.3 State the Chezy's formula for velocity of flow in open channel.
- 13.4 State the Manning's formula for velocity of flow in open channel.
- 13.5 Select the conditions for most economical section of a rectangular channel.
- 13.6 Mention the uses of current meter and float to determine velocity of flow.
- 13.7 Measurement of velocity of flow by current meter and float.

PRACTICAL:

- 1. Measure pressure at a particular section / point of a tank or pipe line:
 - a) by a piezometer.
 - b) by a simple manometer.
- 2. Measure difference of pressure between two sections of a flowing liquid:
 - a) by differential manometer.
 - b) by inverted differential manometer.
- 3. Demonstrate proof of Bernoulli's theorem.
- 4. Measure discharge through a pipe line by venturimeter.
- 5. Determine coefficient of discharge (Cd), coefficient of velocity (Cv) and coefficient of contraction (Cc).
- 6. Measure discharge through a triangular notch (V-notch) and determine the coefficient of discharge.
- 7. Determine the co-efficient of friction in GI and PVC pipe.

8. Measure the loss of head due to friction in pipe.
9. Measure the loss of head due to sudden enlargement and sudden contraction of pipe.
10. Observe different types of flow in a typical open channel.
11. Measure velocity of flow in a typical open channel by :
 - a) a current meter.
 - b) a float.
 - c) a pitot tube.
12. Observe hydraulic jump in a typical open channel due to obstruction of flow by a weir and measure the depth of the jump.

REFERENCE BOOKS

1. Hydraulics – E. H. Lewitt
2. A text book of Hydraulics – R. S. Khurmi
3. Hydraulics – H. W. King

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Accounting Theory & Practice

T	P	C
2	3	3

AIMS

- To be able to understand the principles and practices of book keeping and accounting.
- To be able to understand the procedures of general accounting, financial accounting and their applications.
- To be able to understand the concept of income tax , VAT & Public works accounts.

Course Outlines

Concept of book keeping and accounting; Transactions; Entry systems; Accounts; Journal; Ledger; Cash book; Trial balance; Final accounts; Cost account & financial accounting; Income Tax; Public works accounts.

DESCRIPTION;

Theory

1. Concept of book keeping and accounting.

- 1.1 Define book keeping and accountancy.
- 1.2 State the objectives & of book keeping.
- 1.3 State the advantages of book keeping.
- 1.4 Differentiate between book keeping and accounting.
- 1.5 State the necessity and scope of book keeping and accounting.

2. Transactions Analysis.

- 2.1 Define transactions and business transaction.
- 2.2 Describe the characteristics of transaction.
- 2.3 Discuss the classification of transaction.

3. Entry system of Accounting.

- 3.1 State the aspects of transactions.
- 3.2 Define single & double entry system ..
- 3.3 Discuss the principles of double entry system.
- 3.4 Distinguish between single entry and double entry system of book keeping.
- 3.5 Justify whether double entry system is an improvement over the single entry system.

4. Classification of accounts.

- 4.1 Define accounts.
- 4.2 State the objectives of accounts.
- 4.3 Illustrate different type of accounts with example.
- 4.4 Define “Golden rules of Book keeping”.
- 4.5 State the rules for “Debit” and “Credit” in each class of accounts.
- 4.6 Define accounting cycle.

5. Journal .

- 5.1 Define Journal.
- 5.2 State the functions of Journal.
- 5.3 Mention the various names of Journal.
- 5.4 Interpret the form of Journal.

6. ledger.

- 6.1 Define ledger.
- 6.2 Interpret the form of ledger.
- 6.3 State the functions of ledger.
- 6.4 Distinguish between Journal and Ledger.
- 6.5 Explain why ledger is called the king of all books of accounts.
- 6.6 Explain the following terms: Balance, Balancing; Debit balance; credit balance.

7. Cash book & Its Classification.

- 7.1 Define cash book.
- 7.2 Classification of cash book.
- 7.3 Explain cash book as both Journal and Ledger.
- 7.4 Define discount.
- 7.5 Explain the different types of discount.

8. Trial balance.

- 8.1 Define trial balance.
- 8.2 State the object of a trial balance.
- 8.3 Discuss the methods of preparation of a trial balance.
- 8.4 Explain the limitations of a trial balance.
- 8.5 Prepare trial balance from given ledger balance. (practical)

9. Final accounts.

- 9.1 State the components of final account.
- 9.2 Distinguish between trial balance and balance sheet.
- 9.3 Select the items to be posted in the trading account, profit & loss account and the balance sheet.
- 9.4 State the adjustment to be made from the given information below or above the trial balance.
- 9.5 Explain the following terms: revenue expenditure; capital expenditure; depreciation; annuity method demnishing balance method, machine hour method

10. Cost and financial accounting.

- 10.1 Define financial accounting.
- 10.2 State the objectives of financial accounting.
- 10.3 Define cost accounting.
- 10.4 State the elements of direct cost and indirect cost.
- 10.5 Discuss the capital budgeting
- 10.6 Explain the following terms:
 - a. Fixed cost b. Variable cost c. Factory cost d. Overhead cost e. Process cost f. Direct cost g. Operating cost h. Standard cost

11. Income Tax

- 11.1 Define Income Tax.
- 11.2 State the objects of Income Tax.
- 11.3 Classification of assesses.
- 11.4. Taxable income of assesses.
- 11.5 Tax rebate.
- 11.6 Explain the following terms: Income tax year; assessment year, NBR.

12. Public works accounts.

- 12.1 State the important aspects of public works accounts.
- 12.2 Describe the main features of public works accounts.
- 12.3 Define Value Added Tax (VAT)
- 12.4 State the merits and demerits of VAT.
- 12.5 Explain the following terms :Revenue ; Grant ; Bill; Voucher.

PRACTICAL

1. Identify the transaction from given statements stating reasons.
2. Determine Debtor (Dr) and Creditor (Cr.) from given transactions applying golden rules.
3. Journalize from given transactions.
4. Prepare ledger from given transactions.
5. Prepare double column cash book from given transactions showing balances.
6. Prepare triple column cash book from given transaction and find out the balances.
7. Prepare analytical and imprest system of cash book.
8. Prepare trial balance from the given ledger balance.
9. Prepare trading account, profit & loss account and balance sheet from the given trial balance & other information.
10. Prepare cost sheet showing prime cost, factory cost, cost of production, total cost and selling price.

REFERENCE BOOKS

1. Book-keeping & Accounting - Prof. Gazi Abdus Salam
2. Principles of Accounting - Hafiz uddin
3. Cost Accounting - Prof. Asimuddin Mondol
4. হিসাবরক্ষণ ও হিসাববিজ্ঞান - পরেশ মন্ডল
5. উচ্চ মাধ্যমিক হিসাববিজ্ঞান - হক ও হোসাইন
6. আয়কর - ড. মনজুর মোরশেদ