

THIAGARAJAR POLYTECHNIC COLLEGE, SALEM

(Autonomous)

Reg. No.

October/November 2019 Examinations

DIPLOMA IN CIVIL ENGINEERING

Structural Engineering

Year/Sem: III / V (ODD-III)

Max. Marks : 75

Time : 3 hr.

Note: IS 456-2000, IS 800-2007 and Steel tables approved by the Chairman, Autonomous Examinations are permitted.

PART-A

(5 x 2 = 10 Marks)

Note: (i) Answer any FIVE questions out of which question No.8 is compulsory.

(ii) All questions carry equal marks.

- 1 Define characteristic strength of materials.
- 2 Define effective span of beam.
- 3 What is the IS code provisions for effective width of flange for 'T' beam?
- 4 Define nominal shear stress.
- 5 What is the IS code provisions for minimum reinforcement in slabs?
- 6 Define slenderness ratio of compression member.
- 7 What is the IS code provisions for minimum no of bars and size in compression member?
- 8 Define Gross area and net area of tension members.

PART-B

(5 x 3 = 15 Marks)

Note: (i) Answer any FIVE questions out of which question No. 16 is compulsory.

(ii) All questions carry equal marks.

- 9 i) What is meant by R.C.C?
ii) Why the steel reinforcements are provided in R.C.C?
- 10 Write down the IS code provisions for effective spans of cantilever and simply supported beam.
- 11 Draw the cross section of 'T' beam.
- 12 Briefly explain the principles of shear design.
- 13 Differentiate one way slab and two way slab.
- 14 Mention the types of stairs according to structural behavior.
- 15 Write down the effective length of compression members for different ends conditions.
- 16 Briefly explain the classification of steel beams.

PART-C

(5 x 10 = 50 Marks)

Note: (i) Answer all the questions choosing either sub-division (A) or sub-division (B) of each question. (ii) All questions carry equal marks.

- 17 A A rectangular R.C beam of M20 grade concrete is 250mm wide and 500mm deep to the centre of steel. It is reinforced with 3 numbers of 20mm dia. mild steel bars in the tension zone only. Calculate the moment of resistance of the section at the limit state of collapse 10

(OR)

- B A simply supported rectangular beam is to be provided over a clear span of 12 m to carry an udl of 20 kN/m excluding its self weight. Design the mid span section using M20 grade concrete and mild steel reinforcement in tension zone only for the limit state of collapse in flexure .Assume the width of supports as 300mm. 10

- 18 A A singly reinforced 'T' section has a flange width of 1400 mm and a flange thickness of 120mm . It is reinforced with 4 numbers of 20mm dia. Fe.415 grade steel bars at an effective depth of 450mm. The breadth of web is 230mm.Determine the moment of resistance of the section at limit state of collapse if M25 grade concrete is used. 10

(OR)

- B A simply supported rectangular beam of 300 X 500 mm effective size carries a total characteristic load (Dead load + Imposed load) of 80 kN. The percentage of tension steel at the support section is found to be 0.628.The beam is of M20 grade concrete. Design the shear reinforcement using mild steel bars by limit state method. 10

- 19 A Design a simply supported roof slab for a library hall of 3.5m X 12m clear size using M20 grade concrete and Fe.415 grade steel . Width of walls all-around is 230mm.No access is provided to the roof. Weight of weathering course is 1.25kN/m^2 . 10
- (OR)**
- B Design a simply supported roof slab for watchman cabin of clear size 2m X 3m. The thickness of walls around is 200mm. Access is not provided to the roof. The corners of the slabs are not held down. Weight of weathering course will be 1kN/m^2 . Concrete grade M20 and mild steel grade Fe.250 are to be used. 10
- 20 A Design a circular column with circular rings using concrete grade M20 and steel grade Fe.415 to carry an axial load of 700 kN.The effective length of the column is 3.5m.Mild steel bars may be used for transverse reinforcement. Ignore minimum eccentricity. 10
- (OR)**
- B i) What are the basic requirements of footings? 5
ii) Explain the types of footings with sketches. 5
- 21 A Design a single angle tension member to carry a tensile force of 225 kN due to dead load and live load. The angle is to be connected to a gusset plate through one of its leg by fillet welding. $f_y=250\text{ N/mm}^2, f_u =410\text{ N/mm}^2$. (Connection need not be designed). 10
- (OR)**
- B A laterally restrained simple beam has to resist a maximum bending moment of 185 kN.m. The yield strength of the steel is 250 N/mm^2 . Choose a suitable I-section for the beam. 10

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DIPLOMA IN CIVIL ENGINEERING

Environmental Engineering and Pollution Control

Year/Sem: III / V (ODD-III)

Max. Marks : 75

Time : 3 hr.

PART-A**(5 x 2 = 10 Marks)****Note: (i) Answer any FIVE questions out of which question No.8 is compulsory.****(ii) All questions carry equal marks.**

- 1 Define per capita demand.
- 2 Write any two common coagulants used in sedimentation process.
- 3 Define the term sewage.
- 4 What do you mean by solid waste?
- 5 Define soil pollution.
- 6 Write any two types of sewage pumps.
- 7 State any two limitations of EIA.
- 8 What are the two types of service reservoir?

PART-B**(5 x 3 = 15 Marks)****Note: (i) Answer any FIVE questions out of which question No. 16 is compulsory.****(ii) All questions carry equal marks.**

- 9 Differentiate surface and subsurface source of water.
- 10 What is disinfection of water and mention any two methods of disinfection?
- 11 Differentiate between dry and wet weather flow.
- 12 Write short notes on soak pit.
- 13 Write short notes on ozone layer depletion.
- 14 Draw a neat sketch of a manhole and indicate its various parts on it.
- 15 Write any three sources of noise pollution.
- 16 Write any six types of pipes which are used for conveyance of water.

PART-C**(5 x 10 = 50 Marks)****Note: (i) Answer all the questions choosing either sub-division (A) or sub-division (B) of each question. (ii) All questions carry equal marks.**

- 17 A From the following census data, compute the probable population by arithmetical increase method in the years 2010 and 2020. 10

Year	1970	1980	1990	2000
Population	15000	26000	39000	54300

(OR)

- B Describe reservoir intake with a neat sketch. 10

- 18 A Differentiate between slow sand filter and rapid sand filter. 10

(OR)

- B Explain with sketches the grid iron and radial methods of layout of water distribution pipes. 10

- 19 A Explain in detail about the procedure of sewer line laying and testing. 10

(OR)

- B Describe a typical drainage arrangements in buildings with a sketch. 10

- 20 A Describe about the procedure of sewage treatment by the method of sludge process with a flow diagram. 10

(OR)

- B Explain the sanitary landfill method of solid waste disposal with a sketch. 10

- 21 A Explain the harmful effects of air pollution on materials, animals and plants. 10

(OR)

- B With the help of flow chart, describe the methodology of EIA. 10

PART-A**(5 x 2 = 10 Marks)**

Note: (i) Answer any FIVE questions out of which question No.8 is compulsory.
(ii) All questions carry equal marks.

- 1 Name the various types of speciation.
- 2 Define Report.
- 3 Define Net income
- 4 What do you mean by Standard rent and Economic rent?
- 5 What is Sub data?
- 6 List out any three uses of Septic tank.
- 7 List out the works involved in laying of Cement Concrete roads.
- 8 What is the use of bed blocks in Tee beam deck bridge?

PART-B**(5 x 3 = 15 Marks)**

Note: (i) Answer any FIVE questions out of which question No. 16 is compulsory.
(ii) All questions carry equal marks.

- 9 Differentiate between General specification and Detailed specification.
- 10 List out any four documents accompanying the report.
- 11 What are the purposes of Valuation?
- 12 What are the factors that influencing the rent of the building?
- 13 Prepare data for C.M 1:3 – 1 m³

Cement	- Rs. 8.00 per Kg
Sand	- Rs. 460.00 per Cu.m
Mixing Charges	- Rs. 150.00 per Cu.m
- Note : All the above materials are supplied at site
- 14 State the unit of measurements for the following items of work.
 - a) Foundation Concrete in C.C 1:5:10
 - b) Form work for RCC Columns
 - c) Laying pipe lines for Shallow recharge well.
- 15 List out the various works involved in construction of Tee beam deck bridge.
- 16 State any three items of work involved in the construction of open well with Masonry Steining.

PART-C**(5 x 10 = 50 Marks)**

Note: (i) Answer all the questions choosing either sub-division (A) or sub-division (B) of each question. (ii) All questions carry equal marks.

- 17 A Explain briefly about the essential requirements of specifications. 10

(OR)

 B Write a detailed report on the proposed Construction of Community hall in your Town. 10
- 18 A Write short notes on the factors affecting the value of a property 10

(OR)

 B Calculate the present value of the property based on the particulars given below. 10

Value of the land	= Rs. 3,25,000.00
Plinth area of the building	= 60 m ²
Plinth area cost of building	= Rs. 20,000.00/m ²
Age of the Building	= 45 years.
Estimated cost of repairs	= Rs. 90,000.00
Depreciation to be allowed to the building	= 0.7% per annum.

- 19 A Analyse and determine the rates for the following items of work. 10
 RCC slab 120mm thick of mix 1:1½ :3 using 20mm broken jelly with suitable reinforcements including centering, curing etc.. complete – 1m²

Materials and Labour required:**Cement Concrete 1:1½:3 – 10m³**

Broken stone 20mm size	- 9 m ³
Sand	- 4.5 m ³
Cement	- 4308 kg.
Mason II class	- 3.5 Nos
Mazdoor I class	- 21.2 Nos
Mazdoor II class	- 35.3 Nos
Mixing charges extra	

RCC slab 120mm thick of mix 1:1½ :3 – Rate per 1 m²

Concrete 1:1½ :3	- As required
Steel	- 90 Kg/m ³ of concrete
Binding wire	- 1% of reinforcement
Centering	- as required (add 20% extra for sides)
Steel fabrication	- as required.

Cost of materials and labour at site:

Cement	- Rs. 4,000.00/ tonne
Steel	- Rs. 18,000.00/ tonne
Binding wire	- Rs: 50.00 / Kg
Broken stone 20mm	- Rs. 500.00/m ³
Sand	- Rs. 400.00/ m ³
Mason II class	- Rs. 600.00/each/day
Mazdoor I class	- Rs. 450.00/each/day
Mazdoor II class	- Rs. 350.00/each/day
Steel Fabrication	- Rs. 200.00/ 50 kg
Centering charges	- Rs. 400.00/m ²
Mixing charges	- Rs. 200.00/m ³

(OR)

- B Supplying and fixing Indian water closet of size 580mm x 440mm with glazed earthenware with P or S trap with sand cushion and forming flooring around the closet using 40mm broken jelly in lime concrete 1:2:5 mix, 100mm thick and finishing the top with required slope and providing necessary connection to cast iron soil pipe etc.. complete with standard details – 1 No. 10

Materials Required:

Water Closet 580mm x 480mm	- 1 No.
CI pipe 100mm diameter	- 0.6m
Sand for filling	- 0.45m ³
Brick jelly 40mm	- 0.11 m ³

Labour Required:

Plumber I class	- 1 No.
Plumber II class	- 0.25 No.
Mason I class	- 0.5 No.
Mason II class	- 0.5 No.
Mazdoor I class	- 1 No

Materials required for joining:

White cement	- 1 Kg
Cement	- 6 Kg
Spun yarn	- 0.4Kg

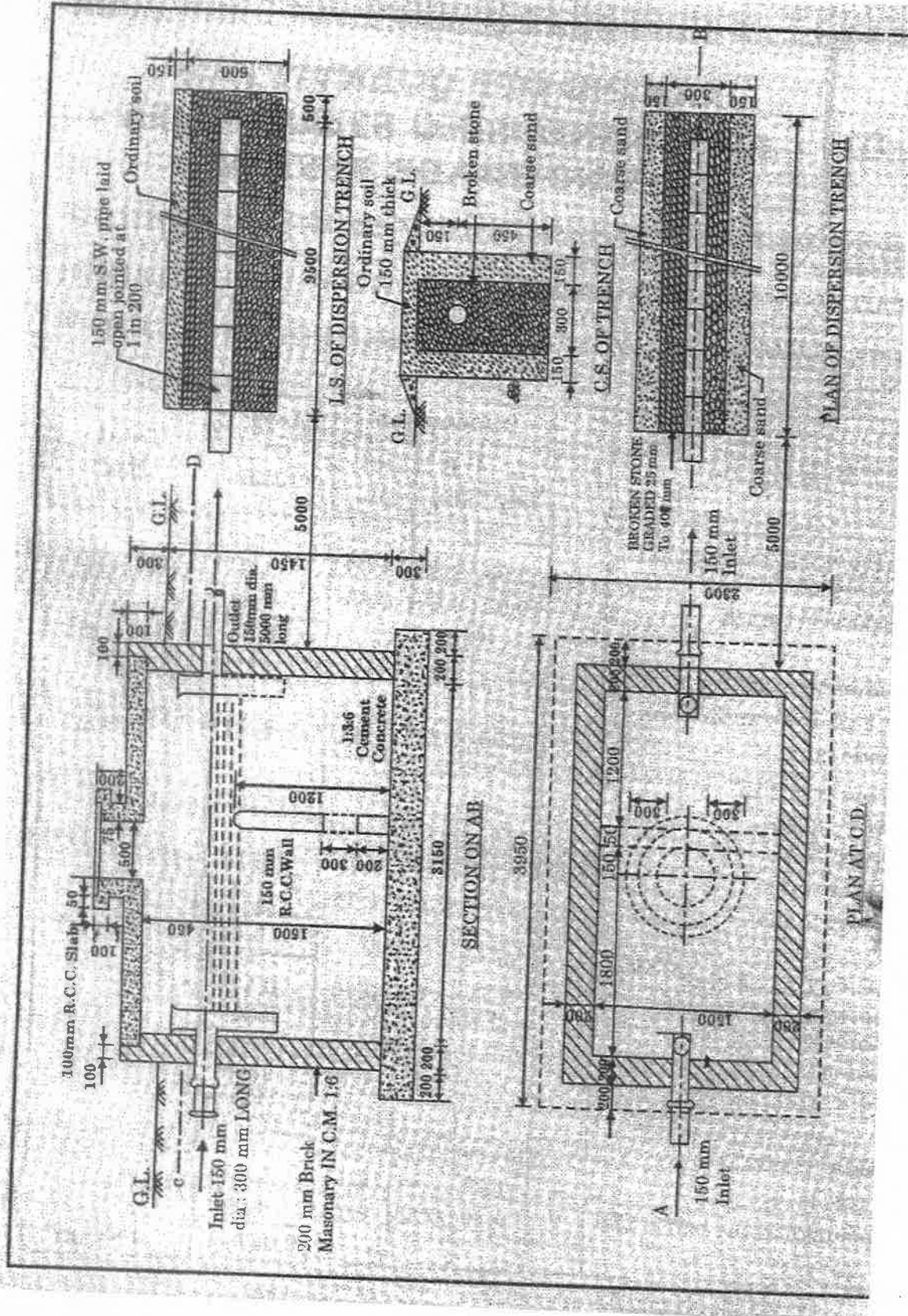
Cost of materials and Labour:

Indian water Closet 580mm x 400 mm	- Rs. 3000.00/ set
CI pipe 100 mm diameter	- Rs. 300.00/m
Sand	- Rs. 500.00/m ³
Brick Jelly 40mm	- Rs. 300.00/m ³
White cement	- Rs. 50.00/Kg
Cement	- Rs. 6.00/ Kg
Spun yarn	- Rs. 25.00/kg
Mason I class	- Rs. 600.00/each/day
Mason II class	- Rs. 550.00/each/day
Mazdoor I class	- Rs. 500.00/each/day
Plumber I class	- Rs. 650.00/each/day
Plumber II class	- Rs. 600.00/each/day

- 20 A Take the quantities for the following items of work of a Septic tank with dispersion trench shown in Sketch 'E' by using trade system.
- i. Brickwork in C.M 1:6 for Septic tank 5
 - ii. RCC 1:2:4 in cover slab and baffle wall. 5
- (OR)
- B i. Earthwork excavation for Septic tank and dispersion Trench. 5
- ii. Plastering in C.M 1:3, 12mm thick. 5
- 21 A Take the quantities of the following works of a RCC slab Culvert shown in Sketch 'F' by using trade system.
- i. CC 1:3:6 in Foundation 5
 - ii. RCC 1:2:4 for slab 5
- (OR)
- B Brickwork in C.M 1:4 10

SKETCH - E

Septic tank with dispersion trench



Code: 150-1401A

CIVIL

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DIPLOMA IN CIVIL ENGINEERING

Soil Mechanics and Foundation Engineering

Year/Sem: III / V (ODD-III)

Max. Marks : 75

Time : 3 hr.

PART-A

(5 x 2 = 10 Marks)

Note: (i) Answer any FIVE questions out of which question No.8 is compulsory.

(ii) All questions carry equal marks.

- 1 What are Atterberg 's limits?
- 2 What is meant by shear strength of soil?
- 3 What are the uses of soil stabilisation?
- 4 Define exit gradient.
- 5 Write any two requirements of foundation.
- 6 What do you mean by swelling pressure?
- 7 Define Natural frequency.
- 8 State Darcy's law.

PART-B

(5 x 3 = 15 Marks)

Note: (i) Answer any FIVE questions out of which question No. 16 is compulsory.

(ii) All questions carry equal marks.

- 9 Explain Three phase system of soil mass.
- 10 Explain Mohr-Coulomb theory.
- 11 What are the objectives of soil exploration?
- 12 Write short notes on seepage pressure.
- 13 What are the factors affecting bearing capacity of soil?
- 14 What are the design steps for machine foundation?
- 15 Explain the stability conditions for Tower line foundation.
- 16 What are the uses of piles?

PART-C

(5 x 10 = 50 Marks)

Note: (i) Answer all the questions choosing either sub-division (A) or sub-division (B) of each question. (ii) All questions carry equal marks.

- 17 A Explain how the liquid limit of soil is determined. 10
(OR)
B Define co-efficient of permeability and explain constant head permeability test. 10
- 18 A Explain Proctor's compaction test to find optimum moisture content. 10
(OR)
B Explain the different types of samplers. 10
- 19 A i. Explain the different types of flow lines. 5
ii. What are the uses of flow net? 5
(OR)
B Explain plate load test in detail with a neat sketch. 10
- 20 A Explain Caisson foundation with a neat sketch. 10
(OR)
B Explain under reamed pile foundation with a neat sketch. 10
- 21 A Explain any two types of machine foundation. 10
(OR)
B i. Explain the forces and their effects on tower foundation. 5
ii. Explain the stability conditions of tower foundation. 5

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DIPLOMA IN CIVIL ENGINEERING

Civil Engineering Drawing-II

Year/Sem: III / V (ODD-III)

Max. Marks : 75

Time : 3 hr.

- Note:** 1. Answer any one question in the drawing sheet supplied.
2. The Drawing should be drawn by using pencil and drawing instruments to scale.
3. Any data, not given may be assumed suitably and should be indicated in the drawing.

1 The following are particulars of an infiltration gallery :

River bed level	: + 100.000m
River bank level	: + 104.50m
Inner diameter of infiltration well	: 4m
Outer diameter of infiltration well	: 4.80m
Number of infiltration well	: 1
Maximum flood level (MFL)	: 103.0m
Lowest summer water level (LSWL)	: + 98.20m
Invert level of stone water pipe	: + 94.00
Diameter of stone water pipe	: 0.40m
Length of gallery pipe	: 50m
Width of gallery	: 1.80m
Cover Slab Thickness	: 100mm

Filter media

Layer of filter media adjacent to the pipe 200mm

Next two layers are of 100mm each

Inner diameter of jack well with

pump house : 6m

Outer diameter of jack well : 6.90m

Inner diameter of inspection well : 3.00m

Outer diameter of inspection well : 3.60m

Assume any other data required suitably.

Draw the following views to a suitable scale

- | | |
|--|----|
| i) General layout of the scheme showing infiltration well, infiltration galleries, inspection wells, jack well and pump house. (Not to scale). | 10 |
| ii) Longitudinal section of infiltration well, one straight gallery, one inspection well and one jack well. | 30 |
| iii) Sectional plan of infiltration well, gallery, inspection well and jack well. | 20 |
| iv) Cross sectional details of infiltration gallery. | 15 |

2 The following are the particulars of a R.C.C square column with square footing.

Column size	: 400mm x 400 mm
Clear cover	: 40 mm
Size of footing	: 2100mm x 2100 mm
Thickness of footing	: 600 mm
Footing Bottom cover	: 50 mm
Footing Side cover	: 75mm

Reinforcement details

Main reinforcement in

Column : 8 Nos. 20 mm diameter Fe415 bars

Lateral ties : 8 mm diameter Fe415 bars @ 250 mm c/c

Footing : 12mm diameter Fe415 bars @ 150 mm c/c in each direction.

Anchorage and curtailment of reinforcement may be adopted with standard values.

Assume any other data required suitably.

Draw the following views to a suitable scale

- | | |
|---|----|
| i) Plan of column with reinforcement details | 10 |
| ii) Cross Section of the column with footing | 25 |
| iii) Plan of footing showing reinforcement details | 25 |
| iv) Prepare a bar bending schedule for column and footing (for 1m height of column) | 15 |