Total No. of Questions : **08** Roll No. : 0701.....

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Civil Engineering)

CE-6301 DESIGN OF STEEL STRUCTURES

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions, each questions carry equal marks. Use of IS 800:2007 and steel table is permitted. Assume any missing data and state clearly.

1(a) Distinguish between plug and slot weld. ***02***

(b) Design a single bolted double cover butt joint to connect boiler plates of thickness 12mm for maximum efficiency. Use M-16 bolts of grade 4.6. Boiler plates are of Fe410 grade. Find the efficiency of the joint. ***12***

2(a) Define with neat sketch the term pitch, edge distance and gauge distance. ***02***

(b) A tie member consists of two ISMC250. The channels are connected on either side of a 12mm thick gusset plate. Design the welded joint to develop the full strength of the tie. However the overlap is to be limited to 400mm? ***12***

3 An ISLB 300 @ 369.8 N/m transmits an end reaction of 385 kN under factored loads, to the web of ISMB 450 @ 710.2 N/m. Design a bolted framed connection. Steel is of grade Fe410 and bolts are of grade 4.6. ***14***

4(a) What is Lug angle? Why Lug angles are used? ***02***

(b) Design a double angle tension member connected on each side of a 10 mm thick gusset plate, to carry an axial factored load of 375 kN. Use 20mm black bolts. Assume shop connection? ***12***

5(a) Compression members are more critical than tension members. Comment. ***02***

(b) Design a simply supported beam of 10m effective span, carrying a total factored load of 60 kN/m. The depth of beam should not exceed 500 mm. The compression flange of the beam is laterally supported by floor construction, assume stiff end bearing is 75 mm. ***12***

6(a) Write a short note on splices of column. ***02***

(b) A column 5.0 m long has to support a factored load of 6000 kN. The column is effectively held at both ends and restrained in direction at one of the ends. Design the columns using Beam sections and Plates. ***12***

7 Design a battened column with two channels back to back of length 10m to carry an axial factored load of 1400 kN. The column may be assumed to have restrained in position but not in direction at both ends (hinged end) Fe415 Grade of steel. ***14***

8(a) Write the various components of plate girder. ***02***

(b) Design a slab base for a column ISHB 300 @ 577 N/m carrying a axial factored load of 1000 kN. M20 grade Concrete is used for foundation. Provide welded connection between column and base plate. ***12***

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Civil Engineering)

CE-6302 SOIL MECHANICS

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Discuss the contribution in the soil mechanics by French Scientist C.A. Coulomb and Professor W.J.M. Rankine. ***07***

(b) Discuss the laboratory procedure to determine specific gravity of the soil. What is the specific gravity of silty soil? ***07***

2(a) A soil in its natural states has, when fully saturated, has a water content of 30.0%. Determine the void ratio, dry and total unit weights. Assume G = 2.62. ***07***

(b) Discuss the meaning of consolidated drained test. Draw the Mohr diagram for triaxial test at failure for c-ϕ soil. ***07***

3(a) The diameter of a clean capillary tube is 0.06 mm. Determine the expected rise of water in the tube. ***07***

(b) Describe the electrical analogy method for the construction of flow net. ***07***

4(a) For a homogeneous earth dam 50 m high and 2.5 m free board, the following data is given for a flow net : $N_d = 25$, $N_f = 4$, $k = 3\times10^{-3}$ cm/sec. Calculate discharge per meter length of the dam. ***07***

(b) List the various laboratory methods to determine coefficient of permeability. Discuss the factors which affect the permeability. ***07***

5(a) A sample of clay soil has a water content of 30% at full saturation. Its shrinkage limit is 17%. Determine degree of shrinkage (S_r). Assume G = 2.70. ***07***

(b) How to estimate vertical pressure below the ground using Newmark's Influence chart. ***07***

6(a) Define the term : (i) capillary rise (ii) flow index. ***07***

(b) Discuss the procedure to estimate shear strength of soil from Box shear test. Also list the limitations of this test. ***07***

7(a) Discuss Rainkine earth pressure theory for cohesion-less soils. ***07***

(b) Describe the Taylor's stability Number's method to find minimum factor of safety. ***07***

8(a) Draw the condition of failure of a retailing wall under active condition. Use Coulomb earth pressure theory. ***07***

(b) Describe the method of slices with failure of circular surface to find minimum factor of safety. ***07***

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Civil Engineering)

CE-6321 (EL-II) ADVANCED RCC

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Solve any five Questions. All questions carry equal marks. Use of relevant IS codes and special publication is permitted. Assume missing data suitably if required after stating clearly. Use M 20 concrete and Fe 415 steel, if not stated in the problem.

1(a) Design a strap Footing for two columns C_1 & C_2 400mm × 400mm & 600mm × 600mm in size spaced at 4.5 m centre to centre distance. Column C_1 is carrying a load of 900 kN & C_2 is carrying a load of 1500 kN. Column C_1 is 400 mm away from the property line. The safe bearing capacity of soil is 150 kN/m^2. ***11***

(b) Explain the different IRC loads considered for the design of bridges. ***03***

2(a) Design a counter fort retaining wall to retain 4m earth above ground level. The top of the earth is to be level. The density of earth is 15 kN/m^2. The angle of internal friction of soil is 30^o. The safe bearing capacity of soil is 200 kN/m^2 and the coefficient of friction between soil and wall is 0.6. ***11***

(b) Write a short note on Raft footing. ***03***

3(a) Design the top dome, top ring beam and cylindrical side wall of an INTZE tank for the following dimensions – the diameter and height of the cylindrical tank is 13m and 5.5 m respectively. The height of the bottom dome is 1.7 m and height of conical dome above the centre of the bottom dome is 1.5m &diameter of bottom dome is 10m. ***12***

(b) Distinguish clearly between a bunker and silo. ***02***

4(a) Design a rectangular water tank by IS code method of size 8m × 5m × 4m which rests on the firm ground. Use M30 concrete and Fe415 steel. Sketch the details of the water tank. ***11***

(b) Explain and compare the 'Cantilever and portal method of approximate lateral analysis'. ***03***

5(a) What are shear walls and it's advantage over rigid frames? ***03***

(b) Design a square Bunker of size 5m × 5m (plan) and height of bunker 5.0m. Height of hopper bottom is 1. 5m and opening is 0.5m × 0.5m. Stored material is coal of density 8.10 kN/m^3 and angle of repose is 30^o. The stored material is to be surcharged at its angle of repose. ***11***

6(a) Explain various kinds of joints used in water tanks. ***02***

(b) A silo with internal diameter 6.0m, height of cylindrical portion 20m and central opening with 0.5m is to be build to store Wheat of density 8kN/m^3. Design the silo, use Jansen's theory for pressure calculation. Coefficient of wall friction u' = 0.444. Pressure ratio k = 0.4. Use M20 concrete and Fe415 steel. ***12***

P.T.O.

7(a) Design a reinforced concrete slab culvert for the following requirements : ***12***

- Clear span = 5.0 m
- Width of supports = 400mm
- Clear width of roadways = 7.0m
- Width of kerbs = 600mm
- Thickness of wearing coat = 80mm thick asphaltic concrete

Load - Class A two lane loading, Use M20 concrete and Fe 415 steel

(b) Describe various method of pre-stressing. ***02***

8(a) Discuss the different types of bracing used in Multistorey building. ***02***

(b) A beam of symmetrical I-section spanning 8 m has a flange width of 200mm and a flange thickness of 60 mm respectively. The overall depth of a beam is 400 mm. Thickness of web is 80mm. The beam is pre-stressed by a parabolic cable with an eccentricity of 150mm at the centre and Zero at supports with an effective pre-stressing force of 100 kN. The live load on the beam is 2000N/m. Draw the stress distribution diagram at the mid span section for the following conditions : ***12***

(i) Prestress and self weight
(ii) Prestress, self weight and live load.

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Civil Engineering)

CE-6331 (EL-III) WASTEWATER ENGINEERING

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks. Assume suitable data if require.

1(a) Write short notes : (i) Drop manhole (ii) Inverted siphon. ***07***

(b) Describe conservancy systems and water carriage systems. What are relative advantages and disadvantage of the two systems? ***07***

2(a) Design a sewer to serve a population of 36000. Daily water supply per capita = 135 lit of which 80% goes into the sewer. Slope, S = 1/625 and the sewer would be designed to carry 4 times the average discharge under design condition. What would be the velocity generated if n = 0.012 and it is assumed to be constant. ***07***

(b) Explain the various chemical characteristics of waste water. ***07***

3(a) Write short note on : (i) Stages of organic decomposition (ii) Oxygen sag curve. ***07***

(b) What do you understand by the grit chamber? Write the various design parameters with its near sketch. ***07***

4(a) Design a SDT for primary sludge with following data : ***07***

- Average sewage flow : 20 MLD
- Total suspended solids of raw sewage : 300 mg/lit
- Moisture content of digested sludge : 85 %
- Solids removed in PST : 60 %
- Specific gravity of sludge : 1.02
- Detention period : 30 days

(b) Compare and contrast septic tank with Imhoff tank in scope, function and performance. ***07***

5(a) Determine the dimension of HRTF : ***07***

- Sewage flow rate : 3 MLD
- Recirculation Ratio : 1.5
- BOD of Raw of sewage : 250 mg/lit
- BOD removed in PST : 25 %
- Final BOD of effluent desired : 300 mg/lit

By what % the diameter of the filter have to be modified if it is designed as a standard rate trickling filter?

(b) What is meant by activated sludge? Describe with sketches the treatment of sewage by activated sludge process. ***07***

P.T.O.

6(a) Explain the methods for nutrient removal from waste water. ***07***

(b) Describe the decentralized wastewater treatment in rural areas. ***07***

7(a) The following observations were made on a 2% dilution of waste water : ***07***

- Dissolved oxygen of aerated water used for dilution = 6.0 mg/L
- Dissolved oxygen of diluted sample after 5 days incubation = 1.2 mg/L

Calculate the BOD_5 and ultimate BOD of sample assuming that the deoxygenation coefficient at test temperature is 0.18 day^{-1}.

(b) Describe skimming tank briefly. ***07***

8 Write short notes on **any four** : ***14***

(i) Construction and Maintenance of sewer
(ii) Population equivalent
(iii) Stabilization pond
(iv) Oxidation Pond
(v) Sludge volume index

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Civil Engineering)

ME-6351 (OEL-I) HYDRO SYSTEM

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Answer any five questions only. Write complete question continuously.

1(a) Describe in detail all types of hydraulic jump. ***07***

(b) Describe all flow profiles with respect to channel bottom slopes. ***07***

2(a) Draw specific energy diagram. ***03***

(b) Discharge of water through rectangular channel of width 8m, is 15 cum/s, when depth of flow of water is 1.2 m. Calculate : ***04***

(i) Specific energy of flowing water
(ii) Critical depth and critical velocity
(iii) Value of minimum specific energy

(c) The depth of flow of water, at a certain section of a rectangular channel of 2 m wide is 0.3 m. Discharge through the channel is 1.5 cum/s. Determine whether a hydraulic jump will occur, and if so find its height and loss of energy per kg of water. ***07***

3(a) Explain most economical channel section, give its significance and derive expression for most economical rectangular channel section. ***1,1,5***

(b) Describe in detail velocity distribution in open channel flow and then draw velocity distribution profile in rectangular and triangular open channels. ***07***

4(a) What are the factors affecting canal alignment? Describe them briefly also write factors affecting alignment of a water course. ***07***

(b) Give comparison of Kenedy's Theory and Lacey's Theory also write drawbacks in Kenedy's Theory. ***07***

5(a) Describe all the factors to be considered while deciding the location of fall. Name only different types of canal falls. ***07***

(b) What do you understand from cross drainage works, explain all types of cross drainage works with their line diagram and briefly explain-changing the canal alignment for cross drainage work. ***07***

6(a) What do you understand from diversion head works and pick up wear. Also differentiate diversion head works with storage works. ***2,2***

(b) Give classification of canals. ***03***

(c) Describe briefly all operations to be carried out for maintenance of unlined irrigation canal. ***07***

7(a) What do you understand by canal lining with especially reference to losses also write advantages and disadvantages of canal lining. ***07***

(b) Briefly explain all the causes of water logging. ***07***

8(a) Write types of Semi Modular outlets and then explain Pipe Outlets, discharging free. ***07***

(b) Describe canal escapes in detail. ***07***

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