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Seventh Semester B.E. Degree Examination, June/July 2019
Design of RCC and Steel Structures

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any TWO full questions, choosing one full question from each module.
2. Use of IS456, IS800, IS3370, SP(6)-steel tables is permitted.
3. Any missing data may be assumed suitably.

Module - 1

1 a. Name the different types of retaining walls. **(04 Marks)**

b. Design a combined footing for two interior columns carrying axial loads 1000kN and 1200kN. Column A is 400mm × 400mm in size and column B is 450mm in diameter. They are reinforced with 20mm bars and are spaced 4m centre to centre as for a bearing capacity of the soil is 120 kN/m^2. Use M20 mix and Fe 415 grade steel. Sketch it. **(36 Marks)**

OR

2 a. Name the different classification of liquid retaining structures. **(04 Marks)**

b. Roof of a 8m wide hall is supported on a portal frame spaced at 4m intervals. The height of the portal frame is 4m. The continuous slab is 120mm thick. Live load of roof is 1.5 kN/m^2, SBC of soil is 150 kN/m^2. The columns are connected with a plinth beam and the base of the column may be assumed fixed. Design the slab, column, beam members for the columns of the portal frame. Use M20 and Fe415 grade steel. Sketch the details. **(36 Marks)**

Module – 2

3 a. Name any 4 various types of roof trusses. **(04 Marks)**

b. Design a welded plate girder for an effective span of 20m to support a Udl of 80 kN/m in addition to a pair of point loads of 870 kN each of 5m from end of beam (10m apart @ center). Design the plate girder. **(36 Marks)**

OR

4 a. What are the advantages of plate girder over trusses? **(04 Marks)**

b. Design a simply supported crane girder for the following data. The girder is electrically operated. Take yield stress of steel as 250MPa.

i) Span of the crane girder = 20m
ii) Span of the gantry girder = 7m
iii) Capacity of the crane = 250kN
iv) Self weight of crane excluding crab = 200kN
v) Weight of crab = 60kN
vi) Wheel base distance = 3.4m
vii) Minimum hook approach = 1.1m
viii) Self weight of rail = 0.3 kN/m
ix) Height of rail = 75mm. **(36 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Design of RCC and Steel Structures

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any TWO full questions, choosing one full question from each module.***
2. ***Use of IS-456, IS-800 SP (6) and Steel tables are permitted.***

Module-1

1 Design a slabtype rectangular combined footing for two columns of size 300mm × 450mm and 300mm × 600mm, subjected to axial loads of 650 kN and 900 kN respectively. The columns are spaced at 3.6 m c/c. The width of the footing is restricted to 1.8 m. Use M20 grade concrete and Fe415 grade steel. Assume SBC of soil = 160 kN/m^2. **(40 Marks)**

OR

2 Design a Cantilever retaining wall to retain an earth embankment with a horizontal top 3.50 m above ground level. The unit weight of back fill is 18 kN/m^3. Angle of internal friction $\phi = 30^\circ$. SBC of soil = 180 kN/m^2. Take coefficient of friction between soil and concrete = 0.55. Adopt M20 grade concrete and Fe415 grade steel.
Depth of foundation = 1.0 m. **(40 Marks)**

Module-2

3 Design a roof truss shown in Fig. Q3 with forces in each member of the truss are given in table Q3. The size of RC column supporting the truss is 300mm × 300mm. Use M20 grade concrete for column. Design the truss using bolt of M16, property class 4.6 for connections and also design anchor bolts. **(40 Marks)**

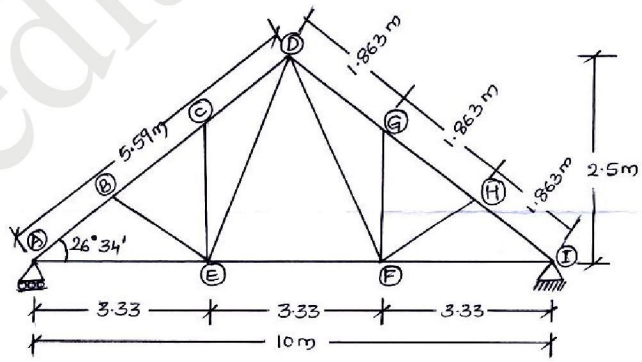

Fig. Q3

Member	Design force in kN	
	Compression	Tension
Top chord member	54.25	-
Bottom chord member	-	48.31
Diagonal member (DF, DE)	14.35	-
Member BE, HF	-	24.50
Member CE, GF	12.40	-

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OR

4 Design a simply supported crane gantry girder for the following data: The crane is electrically operated. Yield stress of steel is 250 N/mm^2.

(i) Span of Crane girder = 20 m
(ii) Effective span of gantry girder = 7.4 m
(iii) Capacity of crane = 220 kN.
(iv) Self weight of Crane girder excluding crab = 200 kN.
(v) Weight of Crab = 60 kN.
(vi) Wheel base distance = 3.4 m
(vii) Minimum hook approach = 1.2 m.
(viii) Self weight of rail = 300 N/m
(ix) Height of rail = 75 mm

Gantry girder is to be supported on RCC column bracket of size $300mm \times 450mm$. Size of column $300mm \times 600mm$. **(40 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Design of RCC and Steel Structures

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any TWO full questions, choosing ONE full question from each module.
2. Use of IS456, IS800, SP(6)-Steel Table is permitted.
3. Assume any missing data suitably.

Module-1

1 Design a reinforced concrete combined rectangular slab footing for two columns located at 4.5 m apart. The overall sizes of the columns are 400mm × 400mm and 600mm × 600mm and they are transferring 600 kN and 1000 kN respectively. The centre of the lighter column in 0.4m from the property line. The safe bearing capacity of the soil 150 kN/m^2. Use M20 concrete and Fe 415 steel. Sketch the reinforcement details. **(40 Marks)**

OR

2 Design a cantilever retaining wall to retain an earth embankment with a horizontal top 3.5m above ground level. Density of earth 18 kN/m^3, angle of internal friction $\phi = 30°$. SBC of soil is 200 kN/m^3. Take coefficient of friction between soil and concrete 0.5, Adopt M20 grade concrete and Fe 415 steel. **(40 Marks)**

Module-2

3 The centre line of a roof truss is as shown in the Fig.Q3. The forces in the members of the truss due to dead load, live load and wind load is given below: Design the roof truss member using M16 bolts of property class 4.6. Also design a bearing plate and anchor bolts for a pull of 40 kN. Use M20 grade concrete. Draw to suitable
(i) Elevation of truss greater than half space (ii) Support details.

Member	DL (kN)	LL (kN)	WL (kN)
AB	+ 14.37	+ 21.80	– 37.32
BC	+ 11.64	+ 17.60	– 32.08
CD	+ 12.05	+ 18.26	– 35.90
DE	– 5.13	– 7.70	+ 14.70
EC	+ 2.77	+ 4.18	– 8.42
EB	+ 2.77	+ 4.18	– 9.15
EA	– 12.85	– 19.36	+ 31.69
EF	– 7.69	– 11.61	+ 15.63

Sign :- + ⇒ Compression
– ⇒ Tension

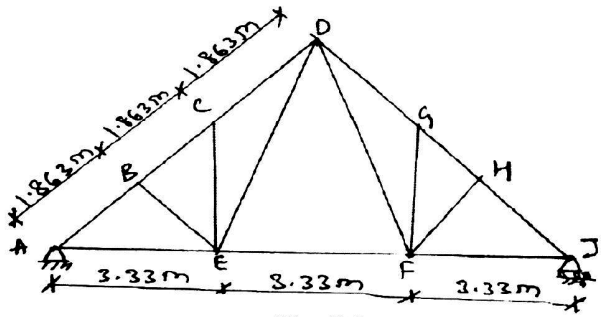

Fig.Q3 **(40 Marks)**

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OR

4 Design a simply supported gantry girder to carry an electrically operated travelling crane with the following details:

(i) Span of the crane bridge ⇒ 25 m
(ii) Span of the gantry girder ⇒ 8 m
(iii) Wheel base ⇒ 3.5 m
(iv) Crane capacity ⇒ 200 kN
(v) Weight of crane bridge ⇒ 150 kN
(vi) Weight of trolley (crab) ⇒ 75 kN
(vii) Minimum hook distance ⇒ 1.0 m
(viii) Weight of rail ⇒ 0.30 kN/m
(ix) Height of rail ⇒ 105 mm

Draw neatly cross section of gantry girder showing all details. Also draw side view.

(40 Marks)

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Seventh Semester B.E. Degree Examination, Aug./Sept.2020
Design of RCC and Steel Structures

Time: 3 hrs. Max. Marks: 80

Note:* 1. *Answer any TWO full questions, choosing ONE full question from each module.
2. Use of IS-456, IS-800, SP(16), SP(6) and steal tables are permitted.

Module-1

1 Design a slab type rectangular combined footing for two columns, A = 350 mm × 350 mm and B = 400 mm and 400 mm in size to carry axial service load of 600 kN and 900 kN respectively. The columns are spaced at 3.6 m centre to centre. SBC of soil is 175 kN/m^2. The property line is 0.74m from centre of column A. Use M20 grade concrete and Fe-415 grade steel. **(40 Marks)**

OR

2 Design a single bay portal frame, fixed at the base for the following data:
Effective span of portal frame = 10 m
Spacing of portal frame = 4 m
Height of column above footing = 5.5 m (effective)
Thickness of slab to be adopted = 150 mm
Live load on slab = 1.6 kN/m^2
Floor finish = 0.75 kN/m^2
SBC of soil = 200 kN/m^2
Use M20 grade concrete and Fe 415 steel. Design the slab, beam, column and footing.
(40 Marks)

Module-2

3 The centre line of a roof truss is as shown in Fig.Q3. The magnitude and nature of forces under service conditions are :
Top Chord members = 120 kN Compression
Bottom Chord members = 100 kN Tension
Interior members = 60 kN Tension and 50 kN Compression
For all the interior members use similar single angle sections. Design all the members and joints using M_{16} turned bolts of grade 4.6. Also design bearing plate, base plate and anchor bolts to connect the truss to an RCC column 300 mm × 300 mm of M_{20} grade concrete.

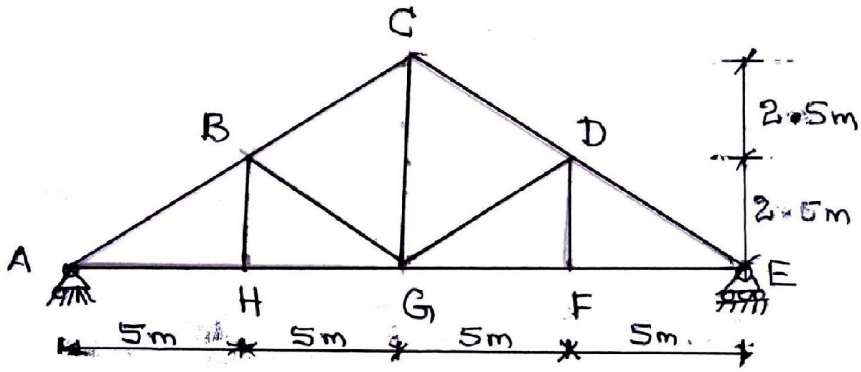

Fig.Q3 **(40 Marks)**

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OR

4 Design a welded plate girder, effective span of 18 meters is simply supported at its ends. It carries a uniformly distributed load of 60 kN/m in addition to two point loads each of magnitude 400 kN placed at one third span points. Design:

(i) Cross section of plate girder at midspan.
(ii) End and intermediate stiffeners
(iii) Welded connection between flange and web
(iv) Welded connection between web and stiffeners **(40 Marks)**

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