Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: 8th Civil Engineering

Regular Examination May/June 2013

C801 Advanced Structural Design

Time: 3 Hours Total Marks: 70

Instruction: 1.All Questions are Compulsory
2. Figure to the Right indicates full marks.
3. Assume Suitable Data if necessary.

Section – I

Q-1 Design side walls and hopper bottom of a rectangular bunker of capacity 600 kN to store coal using M20 concrete and Fe415 steel. Unit weight of coal is 9.5 kN/m^3. Angle of repose of coal, φ=20°. **12**

OR

Q-1 Design side walls and hopper bottom of a circular bunker of capacity 550 kN to store coal using M20 concrete and Fe415 steel. Unit weight of coal is 8.5 kN/m^3. Angle of repose of coal, φ=25°. Give the check for direct stress and shear stress. **12**

Q-2 A silo with internal diameter 7m, height of cylindrical portion 20m and central opening with 0.5m is to be built to store wheat. Design the silo using M20 grade concrete and Fe415 steel. **11**

Given:

Unit weight of wheat = 8.5 kN/m^3
Angle of internal friction = 25°
Angle of wall friction = 0.65φ while filling
= 0.50φ while emptying
Pressure ratio $p_h/p_v = K = 0.4$ while filling
Use Janssen's theory for pressure calculations.

OR

Q-2 A silo with internal diameter 5m, height of cylindrical portion 22m and central opening with 0.5m is to be built to store wheat. Design the silo using M20 grade concrete and Fe415 steel. **11**

Given:

Unit weight of wheat = 9.5 kN/m^3
Angle of internal friction = 28°
Angle of wall friction = 0.75φ while filling
= 0.60φ while emptying
Pressure ratio $p_h/p_v = K = 0.5$ while filling
Use any theory for pressure calculations.

Q-3 **Give the answers of following questions.** **12**

(i) Give the difference between Bunkers and Silos with neat sketches.
(ii) Derive the expression for finding angle of plane of rupture in silos in Airy's theory. Assume plane of rupture intersects horizontal top surface.
(iii) Janssen's theory

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Section – II

Q-4 Design a reinforced concrete slab culvert for the following requirements and sketch the details of reinforcements in the longitudinal and cross section of slab culvert. Also check for shear. **15**

Clear span – 6.5m, Width of supports - 400 mm, Clear width of roadways - 6.6 m, Width of kerbs - 600 mm, Width of bearing = 400 mm, Footpath is 1 m on either side, Thickness of slab at 75 mm per meter of span for highway deck slab, Thickness of wearing coat - 80 mm, Load - class AA, Grade of concrete M - 20, Grade of steel, Fe – 415, m = 10, σcb = 6.67 N/mm2 , σst = 200 N/mm2, n = 0.25, J = 0.91 and assume suitable data if required.

OR

Q-4 A road bridge deck consists of a reinforced concrete slab continues over Tee beams spaced 3.5 m apart and cross girders spaced at 5 m centers. Thickness of wearing coat = 100 mm. Type of loading is **IRC Class AA** tracked vehicle. Using M-25 grade concrete & Fe-415 HYSD bars design the interior slab panel and check for shear. Also draw the section of the slab. The design should conform to the relevant IRC codes. **15**

Q-5 The shear wall 180 mm thick, with boundary elements 400 x 400 mm each at 3500 mm c/c is subjected to axial force Pu = 1600 KN, bending moment Mu= 4000 KN and shear force Vu = 1500 KN. Design the reinforcement in the wall and main steel in boundary element. Draw the sketch of Reinforcement in shear wall with boundary element. **10**

Q-6 **Attempt any two.** **10**

(i) What is shear wall? Explain in detail behavior of shear walls, with particular reference to their typical mode of Failure.

(ii) Write down the different live load condition according to IRC Standard and explain in detail with sketch IRC Class AA Loading condition.

(iii) What are the different methods of analysis of slab subjected to concentrated load? Explain in brief.

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