Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name : Structural Design - 1

Subject Code : 4TE07STD1 **Branch: B.Tech (Civil)**

Semester : 7 **Date :20/03/2018** **Time : 10:30 To 01:30** **Marks : 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.
(5) IS 456 -2000, IS 800 -2009, SP-16, permitted during examination.

Q-1 **Attempt the following questions:** **(14)**

a) List various type of load acting on building. (1)
b) What is characteristic load? (1)
c) What is the minimum and maximum percentage of steel provide in column? (1)
d) What is minimum diameter of bar used in column? (1)
e) Write equation to find development length. (1)
f) What is column? (1)
g) What is the minimum reinforcement required for footing? (1)
h) If $l_y / l_x > 2$ than slab is ……. (1)
i) Calculate design compressive strength of concrete for M-20 (1)
j) In two way slab main steel provide in which direction? (1)
k) What is the standard clearance for 24mm bolts? (1)
l) In which situation double bolted lap joint used? (1)
m) Write any two advantages of weld. (1)
n) List some of the tension member used in buildings and bridges. (1)

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

(A) A beam 200mmx300mm (effective) is used as 2m cantilever beam to supports the factored load of 15 kN/m calculate area of tension steel and draw sketch. Also check for deflection. Take M-20, Fe-415. **(7)**

(B) Find tension and compression steel area required in R.C beam 300mmx600mm to resist factored B.M of 325 kN-m .Take 50mm effective cover on both faces use M-20 , fe-415 **(7)**

Q-3 **Attempt all questions** **(14)**

(A) Calculate area of steel required for a short RCC column 400mmx450mm to carry an axial load of 110KN.Use f_{ck}=20Mpa and Fe 415 grade of steel **(7)**

(B) Design a circular column to carry an axial load of 1600KN. Using helical reinforcement. M-25 grade of concrete and Fe-415 grade steel used. Sketch the reinforcement details. **(7)**

Q-4 **Attempt all questions** **(14)**

(A) Design a square isolated sloped footing for a column od size 500mmx500mm carrying a service axial load of 2000KN. Safe bearing capacity of soil is 250kN/m^2. Use M-20 and Fe-415 steel. Check shear & bearing pressure is not required draw neat sketch. Take $\gamma_{f=1.5}$ **(7)**

(B) Deign a simply supported one way slab for an effective span of 3.0m to carry total factored load of 9 kN/m^2 Use M-20 concrete and fe-415 steel **(7)**

Q-5 **Attempt all questions** **(14)**

(A) A short concrete column of size 400mmx400mm is subjected to factored axial load 1300KN M_{ux}=190KN.m M_{uy}= 110KN.m . Design the reinforcement in column assuming M 25 concrete and Fe-415 steel and effective cover 60mm **(7)**

(B) Design a simply supported two way slab for a clear size 3mx4m for a superimposed load of 3KN/m^3 by limit state method. Use concrete grade M-20 and steel Fe-415. Wall thickness is 250mm. Assume corners are held down. **(7)**

Q-6 **Attempt all questions** **(14)**

(A) Determine bolt value of 20mm diameter, 8.8 grade HSFG bolts connecting two plates 12mm thick and 200m wide. Grade of plate is 410Mpa. Also deign the lap joint if it is subjected to deign tension load of 250kN. **(7)**

(B) Two ISA 110x110x8 mm are connected on both(either side) side of gusset plate to resist and axial force of 400kN. considering 6 mm size fillet weld on toe and back , design the welded connection and show details
Assume shop welding , Fe 410 grade steel and 8 mm thick gusset plate. **(7)**

Q-7 **Attempt all questions** **(14)**

(A) Design a tension member to carry a factored load of 230kN. Use single unequal angle with 4mm fillet weld for the connection to gusset plate. Length of member is 3.0m take f_y = 250MPa and f_u = 410MPa **(7)**

(B) Design a double angle discontinues strut to carry a factored load of 200kN. Length of strut is 3.0 m between intersections. The two angle are connected back to back on opposite side of gusset plate and tack bolted. **(7)**

Q-8

Deign a simply supported beam of span 7m carrying R.C.C slab capable of providing lateral restraint to the top compression flange. The beam is subjected to total U.D.L of 100kN dead load excluding self weight plus 150kN imposed load in addition the beam carries a point load at mid span made up of 50kN dead load and 50kN imposed load. **(14)**