Sample Question Paper

Course Name : Civil Engineering Group

Course Code : CE/CS/CR/CV

Semester : Sixth for CE/CS/CR and Seventh for CV

17604

Subject Title : Design of R.C.C. Structures

Marks : 100   **Time: 4 Hours**

Instructions:

1. All questions are compulsory

2. Illustrate your answers with neat sketches wherever necessary

3. Figures to the right indicate full marks

4. Assume suitable data if necessary

5. Preferably, write the answers in sequential order

6. Use Limit State Method for all design and analysis problems.

Q1. A) Attempt any THREE   **3x4=12**

a) State any four functions of reinforcement in RC sections.
b) Draw the stress block diagram under LSM
c) What are the earthquake damages to RCC buildings
d) Write any four advantages of Prestressed concrete.
e) State IS specifications for minimum shear reinforcement and maximum spacing of stirrups in beam

Q1. B) Attempt any ONE   **1x6=6**

a) A rectangular RC beam section to carry a working BM of 80 kNm. Assume b=1/2(d). Use M20 concrete and Fe415 steel. (Checks are not expected.) Design the section. Find overall depth, width and total steel required.

b) An RC beam section is 230mm wide and 415mm effective depth is subjected to a factored BM of 50kNm. Determine the reinforcement required at the bottom if use of M20 concrete and Fe415 steel is made

Q2. Attempt any TWO   **2x8=16**

a) The passage 2.75m wide is supported on 230mm thick side walls. It carries superimposed loads of 3.75 kN/sq m including floor finish. Design a suitable one way slab using M20 concrete and Fe415 steel. Take MF=1.4. Find D, factored BM and reinforcement details using suitable diameter of bar. Sketch the c/s of slab along shorter span showing reinforcement details (Checks not required)

b) The effective dimensions of a slab panel are 4m x 7m. It carries superimposed loads of 3kN/ Sq m. Design a suitable slab using M25 and Fe 415 steel. Take MF=1.25, α_x= 0.113 and α_y= 0.037. Find D, factored BM and reinforcement details using suitable diameter of bar. Sketch the c/s of slab along shorter span showing reinforcement details (Checks not required)

c) A cantilever slab for 2.5m span carrying a superimposed load 2.25kN/sq m including floor finish. Use M20 and Fe250 steel bars as reinforcement. Take MF=1.95. Find D, factored BM and reinforcement details using suitable diameter of bar. Sketch the c/s of slab along shorter span showing reinforcement details (Checks not required)

Q3. Attempt any FOUR   4x4=16

a) Write the expression for ultimate moment of resistance in a singly reinforced T-beam having NA within the flange and when NA lies at the bottom of the flange.

b) A T-beam flange width of 1.5m and an effective depth of 400mm and slab thickness =100mm and breadth of the web=230mm. Beam is reinforced on tension side only with total steel area of 2000 sq mm. Using LSM calculate the limiting moment of resistance, if M15 Concrete and MS is used.

c) Diameter of a steel bar is 20 mm .Use Fe 415 steel and design bond stress is 1.2 Mpa for plain bars in tension. Calculate the development length in compression

d) What is the development length? How it is calculated?

e) A circular column to carry an axial load of 1400kN using MS lateral ties. Use M20 Concrete and Fe415 steel. The unsupported length of column is 4m. Design the section.

Q4. A) Attempt any THREE   3x4=12

a) State any four losses in prestressing and describe any one.

b) Calculate working load carrying capacity of column 300 mm x 450 mm in dimensions and provided with 8-16mm diameter bars. Use of M20 and Fe 500 steel is made.

c) Define
    i)   Characteristic strength   and
    ii)   Characteristic load

d) State four situations where doubly reinforced section is preferred.

Q4. B) Attempt any ONE   1 X 6=6

a) A RC beam 230 x 415mm effective is subjected to a working moment of 140kN/m. Calculate area of steel in tension and compression zone. Use M20 and Fe415 steel (Assume d'=45mm and d'/d = 0.1, f_{sc}= 353Mpa)

b) A beam 250mm x 480 mm deep . It is reinforced with 4- 20mm diameter bars in tension zone and 2-12mm diameter bars in compression zone, each at an effective cover of 40mm. Use M20 mix and Fe415 steel. Find the moment of resistance

Q5. Attempt any TWO   2X 8 = 16

a) A doubly reinforced section for a rectangular RC beam at midspan having an effective span of 4m. The superimposed load is 60kN/m and size of the beam is limited to 230mm x 420mmm overall. Use M20 and Fe415 steel. Design the section

b) A beam 250mm x 365mm effective depth is reinforced with 3 bars of 16mm dia. Of grade Fe415. The SF at the support is 60kN. Design the shear reinforcement. Use M20 concrete and 6mm dia vertical stirrups

% P_t	0.5	0.75
τ_c in MPa	0.48	0.56

c) A square column of size 480mm x 480mm carries an axial load of 1700kN. Determine the size of Square footing for column if the SBC of the soil is 300kN/sq m. Calculate the depth of footing for BM criteria. Use M25 and Fe415 steel

Q6. Attempt any FOUR   4 X4 = 16

a) A T- beam with following dimensions b_f= 1500 mm, b_w= 300 mm, d= 560 mm, D_f= 120 mm A_{st} = 4200 mm^2, use of concrete M20 and steel Fe 415 is made. Calculate the limiting moment of resistance

b) Why over reinforced sections are disallowed in Limit State Method? Give reason.

c) Calculate effective flange width of t beam for following data.
   i) c/c distance between supports = 8 m
   ii) slab thickness = 120 mm
   iii) c/c distance between beams = 4 m
   iv) width of rib = 300 mm
   v) effective depth = 570 mm
   vi) width of support = 400 mm

d) Write is specifications for minimum eccentricity and transverse reinforcement of an axially loaded column.

e) What is effective length for a column, write the expression for effective length of column
   i) Fixed at both the ends
   ii) Fixed at one end and free at other end.
   iii) Fixed at one end and pined at other end.

Note: Instruction to Paper Setter

All data required for designing the R.C.C. components shall be provided. E.g. Modification factor, Kumax, Rumax, Tcmax, Xx, Xy fsc, etc.

Sample Test Paper - I

Course Name : Civil Engineering Group

Course Code : CE/CS/CR/CV

17604

Semester   : Sixth for CE/CS/CR And Seventh for CV

Subject Title : Design of R.C.C. Structures

Marks   : 25   **Time: 1.5 Hours**

Instructions:

1. All questions are compulsory

2. Illustrate your answers with neat sketches wherever necessary

3. Figures to the right indicate full marks

4. Assume suitable data if necessary

5. Preferably, write the answers in sequential order

6. Use Limit State Method for all design and analysis problems.

Q1. Attempt any THREE   **(3 x 3 = 9)**

a) Define limit state and partial safety factor of material strength and design strength.

b) What are doubly reinforced sections and where they are provided? Mention two situations.

c) Draw stress diagram for balanced ,under reinforced and over reinforced section

d) Draw IS code stress block diagram for singly reinforced rectangular section in its limit state of collapse

e) Define characteristic strength and characteristic load

Q2. Attempt any TWO   **(2 x 4 = 8)**

a) A singly reinforced beam 250 x 465mm, effective to the centre of 6-16 mm dia. Use of Fe415 steel and M20 concrete is made. Find the ultimate moment of resistance of the beam.

b) A singly reinforced beam 230 x 415mm, effective c/s is simply supported over a span of 8m. Beam is reinforced 6-12 mm dia. Bars in tension. Calculate the max. UDL it can carry over entire span. Use M20mix and Fe500 steel

c) A RCC rectangular beam having an effective span 5m. It carries udl of 12kN/m including its self weight over its entire span. Use M20mix and Fe415 steel. Take width of   beam as 230mm and 25mm clear cover. Design the section. Find D and A_{st}

Q3. Attempt any ONE   **(1 x 8 = 8)**

a) A RC beam section 230mm x 415mm effective in dimensions. It is reinforced by 3-12mm dia bars as compression steel with an effective cover of 30mm, Where as 4-16mm dia are placed on tension side. Assume M20 concrete and Fe415 steel. Take f_{sc}= 352.75MPa. Calculate the Moment of resistance

b) A doubly reinforced section for a rectangular beam having a effective span of 5m . The superimposed load is 40kN/m and size of the beam is limited to 230mm x 450mm overall. Assume M20 concrete and Fe415 steel. Design the section, find A_{st} and A_{sc}

…………………………………………………………………………………………

Sample Test Paper - II

Course Name : **Civil Engineering Group**

Course Code : **CE/CS/CR/CV**

17604

Semester : **Sixth for CE/CS/CR And Seventh for CV**

Subject Title : **Design of R.C.C. Structures**

Marks : **25**   Time: **1.5 Hours**

Instructions:

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order
6. Use Limit State Method for all design and analysis problems.

Q1. Attempt any THREE   **(3 x 3 = 9)**

a) State IS specifications for effective flange width of T and L beams.

b) What is development length? Write the expression for L_d and meaning of each term involved in it.

c) Write IS specification for minimum eccentricity and transverse reinforcement of an axially loaded short column.

d) State the reason for providing minimum shear reinforcement in the form of stirrups.

e) Differentiate between one way and two way slabs.

Q2. Attempt any TWO   **(2 x 4 = 8)**

a) A column 230 x 450 mm has 6 nos. of 20 mm diameter bars. Use M20 and Fe 415 steel. Compute working load carrying capacity

b) The diameter of a bar is 16 mm. Use Fe 500 steel and design bond stress is 1.2 Mpa for plain bars in tension. Calculate the development length in compression

c) A floor beam 230 x 500 mm, continuous over 3 supports, is simply supported at it ends. Each span is 5 m. the slab supported by the beam is 120 mm thick. Determine the effective flange width of 'T' beam.

Q3. Attempt any ONE   **(1 x 8 = 8)**

a) An open terrace 5 m wide is supported on 300 mm thick side wall. It carries superimposed load of 3.5 kN/m including floor finish. Design one way slab using concrete M20 and Fe415 grade. Take M. F. = 1.4. Sketch cross-section of slab along shorter span showing reinforcement details. (shear and deflection checks are not necessary)

b) A two way slab of a hall 4m x 5.2m (effective) if it carries a live load of 4 kN.m^2. Corners are not held on. Check the slab for deflection only. Use M15 concrete and Fe415 Steel. Take α_x= 0.093 and α_y= 0.055 assume % steel as 0.31 and MF=1.4. Design the section and sketch cross-section of slab along shorter span showing reinforcement details. (shear and deflection checks are not necessary)

....