BE Semester-V (Civil Engineering) Question Bank

(INTRODUCTION TO STRUCTURE DESIGN-I)

All questions carry equal marks(10 marks)

Q.1	a. Compare Working Stress method and Limit State Method of Design. b. A singly RC beam has effective dimension of 230mmx450 mm. It is reinforced with 3 nos- 20 mm dia. Find out moment of resistance of beam. Consider concrete of grade M20 and HYSD steel reinforcement of Fe 415 grade.
Q.2	a. Discuss in brief various types of slabs as per their structural classification. b. Calculate limiting moment of resistance and area of steel for a singly reinforced beam section 200 mm wide and 400 mm effective depth. Consider concrete of grade M20 and HYSD steel reinforcement of Fe 415 grade.
Q.3	a. What should be maximum percentage and spacing of main and distribution bars in slab , as per IS 456(2000). b. A singly reinforced rectangular beam size of 230mmX500mm effective depth has resist a factored moment of 90 KNm. Calculate the area of steel required and show reinforcement details. Consider concrete of grade M20 and HYSD steel reinforcement of Fe 415 grade.
Q.4	a. Explain the Under-reinforced and Over-reinforced beam. b. A singly reinforced rectangular beam is subjected to a bending moment of 200 KN-m. Design the beam section for flexure. Consider concrete of grade M20 and HYSD steel reinforcement of Fe 415 grade.
Q.5	a. What is bond strength of concrete . b. A singly reinforced rectangular beam of 5 m span is simply supported and carries a super imposed characteristic dead load of 18 KN/m and live load of 12 KN/m in addition to its self weight. Design the beam for flexure at mid span.
Q.6	A doubly reinforced beam of 300 mm X 600 mm effective depth is reinforced with 3-16 mm dia. bars as compression reinforcement and 5-25 mm dia. bars as tensile reinforcement. Effective cover on both sides is 50 mm. Calculate the moment of resistance of the beam. Consider M-20 grade of concrete and Fe-415 steel bars is used.
Q.7	a. State the on site measures to control the deflection. b. Find the moment of resistance of the beam section 250 mm x 500 mm deep if it is reinforced with 2-12 dia in compression and 4-16 dia in tension, each at an effective cover of 40 mm. Grade of concrete–M20, Grade of steel–Fe 415 .
Q.8	a. As per IS-456, What are the maximum and minimum percentage of reinforcement in slab. b. Find moment of resistance of a T beam with flange width = 1500 mm, depth of flange 150 mm, web 300 mm wide, effective depth 600 mm and reinforcement of 4-20 mm dia. Bars.
Q.9	a. What is the need of providing distribution reinforcement. b. A flange beam with flange width 960 mm, web width 200 mm, thickness of flange 125 mm, effective depth 450 mm. Determine the Moment of resistance of balanced section and also the amount of reinforcement. Consider grade of

	concrete M20 and HYSD steel of grade Fe 415.
Q.10	a. Determine development length for 20 mm diameter, Fe 415 grade steel bar in compression. Use concrete of grade M20. b. Find the moment of resistance of the beam section 250 mm x 500 mm deep if it is reinforced with 2- 12 dia in compression and 4-16 dia in tension, each at an effective cover of 30 mm. Grade of concrete – M20 and Grade of steel Fe 415.
Q.11	a. What is the difference between Mild steel and HYSD steel. Also state the few characteristics of both types of steel. b. A cantilever beam of 2 m span is projected from column of 400 mm width. The cantilever beam is provided with 4 bars of 20 mm diameter of Fe 415 grade. Effective cover is 50 mm. Determine the anchorage length and sketch the anchorage details. Consider M20 grade of concrete.
Q.12	a. State the nominal cover to meet durability requirement in ***extreme*** exposure. b. A simply supported R. C. C. beam with clear span of 5m, support width 230mm, size of 230mmX420mm deep, tension bars as 4nos. of 16mm dia. bars and clear cover of 25mm. If it is loaded by an all inclusive factored udl of 80kN/m, design the shear reinforcement near support only using 2 legged 8mm HYSD stirrups. Consider grade of concrete M20 and HYSD steel of grade Fe 415.
Q.13	a. As per IS allowable deflection due to dead loads is limited to _____ and final allowable deflection due to all loads is _____. b. A simply supported R. C. C. beam with clear span of 5m, support width 230mm, size of 230 wide and 420mm deep, tension bars as 4nos. of 16mm dia. bars and clear cover of 25mm. Beam is loaded by factored udl of 60kN/m. Design the shear reinforcement near support with 2-legged 8-mm HYSD stirrups.
Q.14	Design a slab for an office building 3.2 m X 9.2 m. The slab is resting on 300 mm thick wall and subjected to Dead Load +Live Load of 7 KN/m^2. Use M20 concrete and Fe-415 HYSD steel as reinforcement. Check the slab for shear.
Q.15	Design a simply supported beam resting on 230 mm thick wall for the following data : Live load 8 kN/m, Dead load 10 kN/m. Design the beam for flexure and Shear only. Assume that the beam is simply supported over the walls. Consider concrete M20 and steel Fe415..
Q.16	a. Classify slabs based on spanning. b. A column of 400mm x 600mm size carries factored axial load of 1600kN. The column is short and having a minimum eccentricity < 0.05D. Design the column and show reinforcement details. Use M20 concrete and Fe-415 HYSD steel.
Q.17	a. Explain: clear cover and effective cover. b. Slab supported on only two edges is to be considered as _____ way spanning slab. c. A short braced column of size 400mm x 400mm is reinforced with 6 no. of 16mm diameter bars. Determine the safe factored load on column. minimum

	eccentricity < 0.05D. Use M20 concrete and Fe-415 HYSD steel.
Q.18	a. State Permissible Span/Depth ratio for Cantilever beam, Simply supported beam and Continuous beam . b. A column of 500mm x 300mm size carries a factored load axial load of 2000kN.The column is short and having a minimum eccentricity < 0.05D. Design the column and show reinforcement details.
Q.19	A RCC column of size 230 x 530 carries a characteristic load of 1200 kN. The column is reinforced with 8-20 # bars in M 25 grade concrete. The allowable bearing pressure on soil is 200 kN/m2. Design an isolated rectangular Pad footing. Consider grade of concrete M20 and HYSD steel of grade Fe 415.
Q.20	A 250mmx750mm column carries a service load of 1500kN. The column is reinforced with 8-25 # bar in M 30 grade concrete. The allowable bearing pressure on soil is 180 kN/m^2 at 1.6 m depth. Design an isolated Slopped footing. Consider grade of concrete M20 and HYSD steel of grade Fe 415.
Q.21	Answer following.(Any Four) a. Define the classes of steel cross section as per IS 800-2007. b. What is the maximum slenderness ratio for a member carrying compressive loads resulting from dead loads and imposed loads? c. For resistance, governed by ultimate stress, partial safety factor for materials, γm is ___ . d. What is the minimum thickness ts of rectangular slab bases, supporting columns under axial compression? e. What is the effective length in case of double angle discontinues struts connected by two or more rivets?
Q.22	Answer following.(Any Four) a. What is the imperfection factor for buckling class b? b. Effective length of prismatic compression members with one end fixed and other end hinged is _____. c. What is the effective slenderness ratio and minimum width of lacing bars? d. What is the maximum slenderness ratio for maximum spacing of lacing bars? e. What are the requirements for spacing of battens?
Q.23	Answer following.(Any Four) a. What is the effective length for simply supported beam, when supports are full restrained against torsion and both flanges fully restrained against warping? b. What is the minimum and maximum spacing for fasteners? c. What is the criteria for minimum and maximum edge distance for fasteners? d. Typical average values for co-efficient of friction is _____ for surface not treated. e. The equation for nominal tensile capacity of the bolt is _____
Q.24	a. List and explain Different types of connection?

	b. An ISA 100x100x8 mm is carrying an axial tensile force of 100 kN with one leg connected to gusset plate 10 mm thickness. Design the joint using M20 bolts of 4.6 grade and Fe 410 plate.
Q.25	An ISA 125x75x8 mm is carrying an axial tensile force of 150 kN with longer leg connected to gusset plate 10 mm thickness. Design the joint using M20 bolts of 4.6 grade and Fe 410 plate.
Q.26	a. List and explain some of the bolts that are used in structural connections. b. Two plates of 8 mm thickness are connected by a single bolted lap joint with 16 mm diameter bolts at 50 mm pitch. Calculate the efficiency of the joint. Take fu of plate as 410 Mpa and 4.6 garde bolts.
Q.27	a. Give the criteria as per IS:800 -2007 for minimum and maximum size of weld. b. 2 ISA 110x110x8 mm are connected on both sides of a gusset plate to resist axial force of 400 kN. Design welded connection and show details by sketch.Use shop welding.
Q.28	a. Which built up column is stronger a) one with lacings b) one with battens? b. A single unequal angle 100x75x6 mm is connected to a 10 mm thick gusset plate at the ends with six 16 mm diameter bolts to transfer tension. Determine the design tensile strength of the angle assuming that the yield and ultimate stress of steel used are 250 Mpa and 210Mpa. Assume that shorter leg is connected to the gusset plate. Also calculate the efficiency of the member.
Q.29	a. What is the main purpose of lacings and batterns? b. Determine the tensile strength of an angle ISA 100x75x6 mm connected to the gusset plate by 4 mm welds toe and back. Take fy=250Mpa.
Q.30	Calculate the tensile strength of an angle ISA 100x100x6 mm connected to the gusset plate by 6 mm welds .Take fy=250Mpa.
Q.31	a. List different modes of failure of tension member. b. Design a tension member to carry a factored load of 230 kN. Use single unequal angle with 4 mm fillet weld for the connection to gusset plate. Length of member is 3 m. Take fy=250 Mpa and fu=410 Mpa.
Q.32	a. List some of the tension members used in buildings and bridges. b. A tension member in a roof truss is subjected to factored tensile load of 300 kN. Design the member using two angles on both side of gusset plate. Assume fy=250 Mpa and 20 mm diameter bolts.

Q.33	a. Distinguish between column and strut. b. Design a single angle discontinuous strut to carry a factored load of 90 kN. The length of member is 3 m. Use fy=250 Mpa.
Q.34	a. State the parameters affecting the strength of compression members. b. Determine the compressive strength of a single angle strut ISA 90x60x8 mm with centre to centre length of 2 m. The angle is loaded through one leg and ends are fixed. Consider 1 bolt at each end.
Q.35	Design a simply supported beam of span 5m carrying working loads of dead load 20 kN/m and imposed laod 15 kN/m. Assume that the compression flange of the beam is laterally restrained throughout.
Q.36	Design a simply supported beam of span 5m subjected to working dead load=25 kN/m and Live load=15 kN/m. The beam is laterally unrestrained. Use Fe 410 grade steel.
Q.37	a. List the checks to be performed for beam member design. b. Under which conditions a beam member can be assumed as laterally restrained?
Q.38	a. What are the types of column bases used in practice? b. State the different steps followed while designing a slab base?
Q.39	Design suitable slab base for column ISHB 300 @63 kg/m carrying axial load of 2700 kN. The safe bearing capacity of soil is 200 kN/m^2 and garde of concrete is M20. Draw two views of your design.
Q.40	Design a gusseted base for a column ISHB 400 with cover plates 400x20 mm on each flange. The factored load on column is 4000 kN. The length of column is 5 m. The safe bearing capacity of soil is 250 kN/m^2. M15 grade concrete is used for pedestal.