

B.Tech. CIVIL ENGINEERING (BTCLEVI)

00135 Term-End Examination
December, 2014

**BICE-013 : STRUCTURAL DESIGN AND
DRAWING – I**

Time : 3 hours

Maximum Marks : 70

Note : Answer any **five** questions. IS 456 and IS 800 codes are allowed. Use of calculators is permitted.

1. (a) Why is limit state design considered more rational than working stress design ? Explain the term 'factored load'. 6
- (b) A reinforced concrete slab 150 mm thick is reinforced with 10 mm cp bars @ 200 mm c/c, located at an effective depth of 125 mm. If M 20 grade concrete and Fe 415 bars are used, estimate the ultimate moment of resistance of the section. 8
2. (a) Explain the difference between a short column and a long column. 6
- (b) An RCC beam 230 mm × 500 mm (effective) carries a u.d.l. of 24 kN/m over a clear span of 4.5 m. The beam is reinforced with 1.5% steel on tension side. Calculate the nominal shear stress and shear strength of the concrete. Also find whether shear reinforcement is required. Use M 20 concrete. 8

3. Design a circular column to carry an axial load of 1500 kN using helical reinforcement. Use M 25 concrete and Fe 415 steel. Take load factor = 1.5. 14

4. Two plates 10 mm and 18 mm thick are to be jointed by double cover butt joint. Design the joint for the following data : 14

Factored design load	750 kN
Bolt diameter	20 mm
Grade of steel	Fe 410
Grade of bolts	4.6

Cover plates 2 (one on each side) 8 mm thick.

5. (a) A tension member 0.95 m long is to resist a service dead load of 20 kN and a service live load of 60 kN. Design a rectangular bar of standard structural steel of grade Fe 410. Assume that the member is connected by one line of 16 mm diameter bolts of grade 4.6. 7

(b) Design a fixed weld for the angle section of an ISA 80 mm × 50 mm × 8 mm (Fe 410 grade steel) welded to a 12 mm thick gusset plate at site. 7

6. Design a laterally unsupported beam for the following data : 14

Tiff span : 4 m
Maximum bending moment : 550 kNm
Maximum shear force : 200 kN
Steel of grade : Fe 410

7. Design a Fink type roof truss for an industrial building for the following data : 14

Overall length of the building : 48 m
Overall width of the building : 16.5 m
Width (c/c of roof columns) : 16 m
c/c spacing of truss : 8 m
Rise of truss : 1/4 of span
Self weight of purlins : 318 N/m
Height of column : 11 m
Roofing and side covering ACC = 171 N/m
Both ends of the truss are hinged.
Use steel of grade Fe 410.
