

GANPAT UNIVERSITY**B. TECH SEM- 5th (Civil) REGULAR EXAMINATION- NOV-DEC 2016****2CI504 : ELEMENTS OF STRUCTURAL DESIGN****TIME: 3 HRS****TOTAL MARKS: 60**

- Instructions:**
- (1) This Question paper has two sections. Attempt each section in separate answer book.
 - (2) Assume suitable data if required and mention it clearly.
 - (3) Figures on right indicate marks.
 - (4) Be precise and to the point in answering the descriptive questions.
 - (5) IS 456 : 2000, IS 800 : 2007 & Steel table is permitted.
 - (6) Use table for Q_{lim} and f_{sc} given at the end of question paper.

SECTION: I

- Q.1** A Single bolted Double cover butt joint is used to connect two plates 12 mm thick. Assuming the bolts of 20 mm diameter. Calculate the efficiency of the joint. Use 410 MPa Plates and 4.6 grade bolts. Draw the detailing of the connection. (10)

OR

- Q.1** A tie member of a truss consisting of an angle section ISA 65 × 65 × 6 mm of Fe 410 grade is welded to an 8 mm gusset plate. Design a weld to transmit a load equal to the full strength of the member. Assume shop welding. Draw the detailing of the connection. (10)

- Q.2** A Single equal angle 75 × 75 × 10 mm is connected to 10 mm thick gusset plate at the ends with six number of 16 mm diameter bolts to transfer tension. Assume 4.6 grade bolts and Fe 410 steel with $F_y = 250$ MPa, $p = 40$ mm and $e = 30$ mm. Determine the design tensile strength of the angle. (10)

OR

- Q.2** A member of a truss having a length of 2.8 m has to carry a factored load of 125 kN. Design a Single angle to carry the load. The ends of the members is hinged. Assume that the load is applied through one leg when it is connected by 2 bolt at each end. (10)

- Q.3** (A) Classify the section ISMB 400. (03)
 (B) Explain Shear leg effect. (03)
 (C) Explain limit state for Steel design. (04)

SECTION: II

- Q.4** A rectangular beam of size 250 mm × 560 mm effective depth is subjected to a factored moment of 250 kNm. Design the doubly reinforced concrete beam. Assume $d' = 40$ mm. The materials are M20 concrete and mild steel reinforcement. (10)

OR

- Q.4** A short R.C.C. column is to carry a factored load of 2000 kN. If the column is to be a square, design the column. Assume $e_{min} = 0.05D$. The materials are grade M20 concrete and H.Y.S.D. reinforcement of grade Fe 415 steel. (10)

- Q.5** A simply supported slab of clear span 2.6 m is supported on 330 mm thick brick wall at one end and on 230 mm thick brick wall at the other. Load on the slab are 1 kN/m² floor finish and 3 kN/m² live load. Design the slab. The materials are grade M20 concrete and H.Y.S.D. reinforcement of grade Fe 415 steel. Perform any three checks for design of slab. (10)

OR

- Q.5** Design a terrace slab of a room 3.2 m × 4.3 m size and simply supported on all four sides on 230 mm thick masonry walls. The water-proofing load shall be taken as 2 kN/m² and live load may be taken as 1.5 kN/m² and floor finish may be taken as 1 kN/m². Use M20 grade concrete and mild steel reinforcement. Perform any two checks for design of slab. (10)

- Q.6** (A) An R.C.C. column of size 300 mm × 300 mm carries a characteristic load of 660 kN. The allowable bearing pressure on soil is 180 kN/m². Design an isolated pad footing. The materials are grade M20 concrete and H.Y.S.D. reinforcement of grade Fe 415 for both, the column and footing. (07)
- (B) What is foundation? Explain the classification of foundation. (03)

-----END OF PAPER-----

Table 1

LIMITING MOMENT OF RESISTANCE FACTORE Q_{lim} N/mm² FOR RECTANGULAR SECTION

f_{ck} , N/mm ²	f_y , N/mm ²			
	250	415	500	550
15	2.22	2.07	2.00	1.94
20	2.96	2.76	2.66	2.58
25	3.70	3.45	3.33	3.23
30	4.44	4.14	3.99	3.87

Table 2

STRESS IN COMPRESSION REINFORCEMENT f_{sc} N/mm² IN DOUBLY REINFORCED BEAM

f_y , N/mm ²	$\frac{d'}{d}$			
	0.05	0.1	0.15	0.20
250	217	217	217	217
415	355	353	342	329
500	424	412	395	370
550	458	441	419	380