# PARUL UNIVERSITY
## COLLEGE OF AGRICULTURE
### B.Tech Agriculture Winter 2019 - 20 Examination

Semester: 3                                                          Date: 10/12/2019
Subject Code: 20103205                                  Time: 10:30 am to 12:30 pm
Subject Name:Design of Structures                 Total Marks: 50

**Instructions**
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.
5. IS: 800-2007, IS: 456-2000 & Steel Tables are Allowed

**Q.1  Do as Directed.**

**A. Fill in the blanks. (Each of 0.5 mark)**                                              **(05)**
1.  Unit mass of steel is_____.
2.  Value of $f_y$ for Fe415 is _____.
3.  ISA stands for_____.
4.  Value of $f_{ck}$ for M25 is_____.
5.  NA is _____.
6.  Number of bars in circular column is_____.
7.  In under-reinforced section $x_u$_____$x_{umax}$
8.  Area of steel in tension is denoted by _____.
9.  DL stands for _____.
10. $D_f$ is _____.

**B. Multiple choice type questions. (Each of 0.5 mark)**                          **(10)**

1 The effective length of a compression member of length *L* held in position and restrained in direction at one end and effectively restrained in direction but not held in position at the other end, is
    a) L                                                          c) 2L
    b) 0.67L                                                   d) 0.85L

2  Minimum pitch provided in riveted connection is
    a) 2d                                                        c) 1.5d
    b) 2.5d                                                     d) 1d

3  When two plates are placed end to end and are joined by two cover plates, the joint is known   as
    a)  Lap joint                                            c)  Butt joint
    b) Chain riveted lap joint                       d)  Double cover butt joint

4  The effective length of a fillet weld should not be less than
    a)  Two times the weld size                    c)  Four times the weld size
    b)  Six times the weld size                      d)  Weld size

5 The difference between gross diameter and nominal diameter for the bolt is
    a)  1.0 mm                                               c) 1.5 mm
    b) 2.0 mm                                               d) 2.5 mm

6  Vertical distance between bolts is known as
    a)  Pitch                                                   c)  Gauge
    b)  Staggered                                           d)  None of above

7 Minimum number of bars in circular column
    a) 5                                                            c) 6
    b) 4                                                            d) 5

8 In I-section beam number of flange will be
    a) 0                                                            c) 2
    b) 1                                                            d) 4

9 If $x_u > x_{umax}$, type of beam section will be
    a) Balanced section                                c) under-reinforced section
    b) over-reinforced section                      d) none of the above

10  Value of $x_{umax}$ for Fe250
    a) 0.48d                                                  c) 0.53d
    b) 0.46d                                                  d) none of the above

11 What will be the value of $f_{ck}$ if M30 grade of concrete is used?
    a) 20N/mm$^2$                                          c) 25N/mm$^2$
    b) 30N/mm$^2$                                          d) 15N/mm$^2$

12 What is $P_d$?
    a) Load carrying capacity          c) Design load carrying capacity of column
    b) Pressure          d) none of the above

13 How to denote angle section?
    a) ISHB          c) ISA
    b) ISHC          d) ISHA

14 In doubly reinforced beam steel is on
    a) Tension Side          c) Compression side
    b) Both a & b          d) None

15 If neutral Axis lies in flange then
    a) $F_c > F_t$          c) $F_c = F_t$
    b) $F_c < F_t$          d) None

16 What will be the bolt diameter if bolt hole diameter is 20mm?
    a) 16mm          c) 18mm
    b) 22mm          d) 24mm

17 Bolt Value will be smaller of
    a) Shear          c) Bearing
    b) smaller of a & b          d) None

18 Maximum value of effective slenderness ratio for roof truss is
    a) 180          c) 400
    b) 350          d) all of the above

19 Value of $_{mo}$ for Fe415 is
    a) 1.01          c) 1.10
    b) 10.1          d) 11.1

20 How to denote area of steel in concrete
    a) $A_{st}$          c) $A_{sc}$
    b) $A_{ct}$          d) All of the above

**Q.2 Do as Directed.**

**A. Define the following. (Any five out of seven)** (05)
1. Pitch
2. Gauge distance
3. Lap joint
4. Write h, $t_f$, A, $b_f$, for ISHB 300@577 N/m.
5. Calculate $A_{st}$ for 4 bars 20mm diameter
6. Neutral Axis
7. Flanged Beam

**B. Write formulas for the following. (Any five out of seven)** (05)
1. Total compressive force, C
2. $F_c$
3. $y_f$
4. $x_u$
5. $T_{dg}$
6. $A_e$
7. $A_{st}$

**Q.3 Write short notes. (Any five out of six) with Diagram** (10)
1. Bolted connection
2. A 18 mm thick plate is joined to a 16 mm plate by 200 mm long effective butt weld. Determine the strength of joint if a double V butt weld is used.
3. Doubly reinforced beam
4. Find factored load if working load is 300 KN.
5. Columns
6. Find $A_n$ if b= 130 mm, n= 2, diameter of bolt = 16mm and thickness of plate = 12mm.

**Q.4 Long Questions/Example (Attempt any three out of four)** (15)
1. Differentiate between bolted and welded connection.
2. Find moment of resistance of a Tee beam using following data:
    I. Flange width = 1500 mm
    II. Web width = 300 mm
    III. Effective depth = 600 mm
    IV. Tension steel = 4-20 mm dia Fe415
    V. Depth of flange = 150 mm
    VI. M20 grade concrete

3. For a limiting section 400mm X 500mm effective depth Determine the following if M20 concrete mix and Fe415 steel is used:

  I.   Total compression in section
  II.  Area of tensile steel
  III. Limiting moment

4. Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 225 KN. The effective length of member is 3 m. Use M20 shop bolts of grade 4.6 for the connection