BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: …… Roll No.: ……..

Branch: …… Signature of Invigilator: ……

Semester: VIth Date: ……..……..

Subject with Code: CE308 STRUCTURAL DESIGN - II

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**
3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.
4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.
5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.
6. Write on both side of the leaf and use pens with same ink.
7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.
8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.
10. Always maintain the highest level of integrity. Remember you are a BITian.
11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI

(END SEMESTER EXAMINATION)

CLASS: BTECH/BARCH **SEMESTER : VI**

BRANCH: Civil & Arch **SESSION : SP/22**

SUBJECT: STRUCTURAL DESIGN II, CE 308

TIME: 2.00 HOURS **FULL MARKS: 50**

INSTRUCTIONS:

1. The question paper contains 6 questions of 50 marks

2. Q1 is multiple choice question, each question carries 1 mark and total of 30.

2. Q2 to Q6 carries 4 marks each and total of 20.

3. The missing data, if any, may be assumed suitably.

***4.* Before attempting the question paper, be sure that you have got the correct question paper.**

5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

6. IS 800:2007 and Steel table are allowed in the examination hall.

Q1. Each question carries one mark.

I. The channel section comes under which buckling class:

(a) a

(b) b

(c) c

(d) d

II. In bolted connections the distance between center of the fasteners shall not be less than:

(a) 1.5 times of the nominal diameter of the fastener.

(b) 2.5 times of the nominal diameter of the fastener.

(c) 3.5 times of the nominal diameter of the fastener.

(d) 4.5 times of the nominal diameter of the fastener.

III. Under which design philosophy the factor of safety term exist:

(a) Working stress method

(b) Ultimate load method

(c) Limit state method

(d) all the options are true

IV. Which of the following iron has lesser value of carbon content:

(a) Cast iron

(b) Wrought iron

(c) Steel

(d) all the options are true

V. Shape factor is the ratio of:

(a) P_u and P_w

(b) M_p and M_y

(c) Z and Z_p

(d) M and M_P

VI. IS 875 Part – 3 (1987) is based on:

(a) Live load

(b) Dead load

(c) Earthquake loading

(d) Wind load

VII. The type of failure modes for the tension members are:

(a) Gross section yielding

(b)Net section rupture

(c) block shear

(d) all the options are true

VIII. When the load line coincides with the center of gravity (c.g) of the bolt group, then the bolts are subjected to:

(a) only shear

(b) only tension

(c) only bending

(d) both shear and tension.

IX. High strength bolts are designed on the basis of

(a) Tension (b) compression (c) shear (d) friction

X. The efficiency of the welded joints is ……. then that of bolted joint.

(a) less (b) more (c) equal (d) none

XI. For welding, the partial safety factor for the site and shop welding are respectively:

(a) 1.25 and 1.5 (b) 1.4 and 1.2 (c) 1.5 and 1.25 (d) 1.2 and 1.4

XII. The minimum size of the weld for the thickness of the thicker member up to 10 mm is:

(a) 3mm (b) 5 mm (c) 6 mm (d) 8 mm

XIII. A steel plate is 25 cm wide and 12 mm thick. If the diameter of the bolt is 18 mm, the net sectional area of the plate is:

(a) 27.84 cm^2 (b) 27 cm^2 (c) 27.48cm^2 (d) 27.6cm^2

XIV. For the block shear failure of a tension member, the failure occurs along a path through the connection involving:

(a) tension on the two perpendicular planes

(b) shear on the two perpendicular planes

(c) tension on one plane and shear on the other perpendicular plane

(d) tension on the plane of connection and compression on the other perpendicular plane.

XV. The design strength of a tension member is given by:

(i) rupture at a critical section

(ii) yielding of gross area

(iii) block shear of the end region of the above

(a) only (i) is correct.

(b) only (ii) is correct

(c) both (ii) and (iii) are correct

(d) all are correct.

XVI. If a structure is statically indeterminate to second degree, then the maximum number of plastic hinges required to render the structure a mechanism is

(a) 1 (b) 2 (c) 3 (d) infinite

XVII. The structural advantages of using steel as a structural member is:

(a) small weight –to- strength

(b) speed of erection

(c) speed of dismantling

(d) scarp value

XVIII. The necking of steel section during tensile test takes place:

(a) at yield stress

(b) in strain hardening range

(c) after reaching ultimate tensile stress

(d) at plastic yielding

XIX. The design wind speed is V. The design wind pressure will be:

(a) $0.4\ V^2$

(b) $0.5\ V^2$

(c) $0.6\ V^2$

(d) $0.8\ V^2$

XX. A structure is to be constructed where basic wind speed is 47 m/s, risk factor is 1, terrain and size factor is 0.98, topographic factor is 1. The basic wind pressure will be:

(a) $46\ N/mm^2$

(b) $1270\ N/mm^2$

(c) $15.6\ N/mm^2$

(d) 2120 N/mm^2

XXI. A frame has an indeterminacy of 2 and the numbers of possible plastic hinges are 3. The collapse is:

(a) Partial

(b) Complete

(c) Over Complete

(d) Cannot be ascertained

XXII. The plastic section modulus $\boldsymbol{Z_{py}}$ of a rectangular section of width b and depth d is:

(a) $bd^2/6$

(b) $bd^2/4$

(c) $db^2/6$

(d) $db^2/4$

XXIII. If the number of possible plastic hinges are 4 and the degree of indeterminacy of the structure is 2 then the number of possible independent mechanism(s) n will be:

(a) 6

(b) 4

(c) 2

(d) 1

XXIV. Which of the following is not a serviceability criteria:

(a) Deflection

(b) Fatigue

(c) Vibration

(d) Force resistance

XXV. Which of the following is not a limit state of strength:

(a) Vibrations in structures

(b) Fracture due to fatigue

(c) Brittle fracture

(d) Rupture of the structure

XXVI. The partial safety factor for materials governed by buckling is:

(a) 1.0

(b) 1.10

(c) 1.15

(d) 1.25

XXVII. The partial safety factor for site weld is:

(a) 1.0

(b) 1.15

(c) 1.25

(d) 1.50

XXVIII. Fire comes under:

(a) limit state of strength

(b) limit state of serviceability

(c) both of these

(d) none of these

XXIX. Q. A butt weld is specified by:

(a) effective throat thickness

(b) leg length

(c) plate thickness

(d) penetration thickness

XXX. The effective length of a steel column effectively held in position at both the ends and restrained in rotation at one end is:

(a) 0.60 x actual column length

(b) 0.65 x actual column length

(c) 0.80 x actual column length

(d) 0.85 x actual column length

Q.2 Define shape factor? Show that the shape factor for a beam with rectangular cross section of depth'd' and width 'b' is 1.5. Also find out the load factor for this case if the factor of safety is 1.5. **(4)**

Q.3 Calculate the strength of 20 mm diameter bolts of grade 4.6 in (i) single shear, (ii) double shear and (iii) bearing. Assume steel to be of grade Fe 410. **(4)**

Q.4 Design a suitable angle section to carry tensile force of 250 kN. Use welded connection **or** bolting connection. **(4)**

Q.5 An ISMB 450 @ 72.4 kg per meter is to be used as a column 4 m long with both the ends as pinned. Evaluate the design compressive axial load on the column section with respect to the maximum slenderness ratio, using the tables. Assume the steel to be of grade Fe410. **(4)**

Q.6 Determine the design bending strength of a simply supported beam of 5 m span comprising of section ISLB 350 @ 49.5 kg per meter considering the beam to be laterally supported. The design shear force V is less than the design shear strength. Assume the steel to be of grade Fe410. **(4)**

or

Q.6. A bracket connection is made with four bolts of 10 mm diameter and supports a load of 10 kN at an eccentricity of 100 mm. The maximum force to be resisted by critical bolt will be **(4)**