KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2018
(Regulation 2015)
Sixth Semester
CIVIL ENGINEERING
U15CET604 : Design of Steel Structures
(IS 800, Steel Hard book are permitted)

COURSE OUTCOMES

CO1:   Design bolt and welded connections for steel structures
CO2:   Design compression and tension members using rolled steel sections.
CO3:   Design steel beams and plate girders
CO4:   Design gantry girders.
CO5:   Design steel roof truss components.
CO6:   Design light gauge steel elements

Time: Three Hours   **Maximum Marks: 100**
Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1.   Match list I and II and select the correct answer by using codes given below the lists (L is the   CO2 [K$_2$]
      actual length of the column):

List I End conditions of the column	List II Effective length
A.	i 1.2L
B.	ii. 2.0 L
C.	iii. 1.0L
D.	iv. 0.65L

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iii	iv	i
d)	iii	i	ii	iv

2. The minimum pitch of the bolt (diameter-d) connection is given by   CO1   [K₁]

   a)   1.5d   b) $1.5d_0 - 1.5$

   c)   3.0d   d)   2.5 d

3. In Beams, failure occur due to   CO3 [K₂]

  1.Bending failure

  2.Shear failure

  3.Direct compression

  4.web buckling failure

   a)   1, 2 and 4   b)   2 and 3

   c)   1 and 2   d)   1, 2 and 3

4. The shape of form factor is introduced in the design of compression members to represent the effect of   CO6 [K1]

   a)   Diagonal buckling   b)   Post buckling

   c)   Local buckling   d)   Vertical buckling

5. The following items consist of two statements, one labeled as the "Assertion (A)" and other as "Reason(R)". Examine these two statements and select the answers from the following codes.   CO2 [K₂]

Assertion (A): With increase in slenderness ratio, the design compressive strength of compression members decrease.

Reason (R): With increase in slenderness ratio, the probability of failure of compression member due to buckling increases.

   a)   Both A and R are Individually true and R is the correct explanation of A   b)   Both A and R are Individually true but R is not the correct explanation of A

   c)   A is true but R is false   d)   A is false but R is true

6. In a plate girder, the longitudinal stiffener is placed at …………   CO3 [K_L]

   a)   At its neutral axis level   b)   a distance of 0.2 d from its compression flange.

   c)   a distance of 0.2 d from its tension flange   d)   a distance of 0.3 d from its compression flange

7. Write the order in which the following members of an industrial roof structure are arranged from higher level to lower one   CO5 [K₂]

  1.Purlin 2. Roof covering 3. Principal rafter 4. Tie beam member

   a)   2-3-4-1   b)   2-1-3-4

   c)   3-4-2-1   d)   2-1-4-3

8. The design wind pressure (p_z) is given by the following expression (where v_z = design wind velocity, v_B = basic wind speed)   CO5   [K₂]

   a) $p_z = 0.6 v_z{}^2$ b) $p_z = 0.6 v_B{}^2$

   c) $p_z = 0.06 v_z{}^2$ d) $p_z = 0.06 v_B{}^2$

9. The following items consists of two statements, one labeled as the "Assertion(A)" and other as "Reason(R)". Examine these two statements and select the answers from the following codes.

Assertion (A): In the I section of the gantry girder, channel section is connected on its compression flange

Reason (R): The longitudinal and lateral force acting on the gantry girder are resisted by channel sections connected on the compression flange .

    CO4 [K2]

   a) Both A and R are Individually true and R is the correct explanation of A
   b) Both A and R are Individually true but R is not the correct explanation of A
   c) A is true but R is false
   d) A is false but R is true

10. The light gauge steel members are   CO6 [K1]
   a) Hot rolled steel members
   b) Made from thick sheets
   c) Formed from thick plates
   d) Cold formed steel members

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11.	Write the advantages of welded joints over the bolted joint.	CO1	[K1]
12.	List the modes of failure in a tension member.	CO2	[K1]
13.	Determine the buckling class of a ISMB 300 section.	CO2	[K2]
14.	What are the component parts of a plate girder?	CO3	[K1]
15.	Distinguish between web buckling and web crippling.	CO3	[K2]
16.	What is meant by HSFG bolts?	CO1	[K1]
17.	State the functions of purlin.	CO4	[K1]
18.	Sketch any four types of steel trusses.	CO4	[K2]
19.	Draw the neat sketch of a gantry girder and its components.	CO5	[K2]
20.	State the advantages of light gauge steel sections.	CO6	[K1]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. Find the efficiency of the lap joint shown in Figure.1. Given M20 bolts of grade 4.6 and Fe410 plates are used.   CO1 [K3]
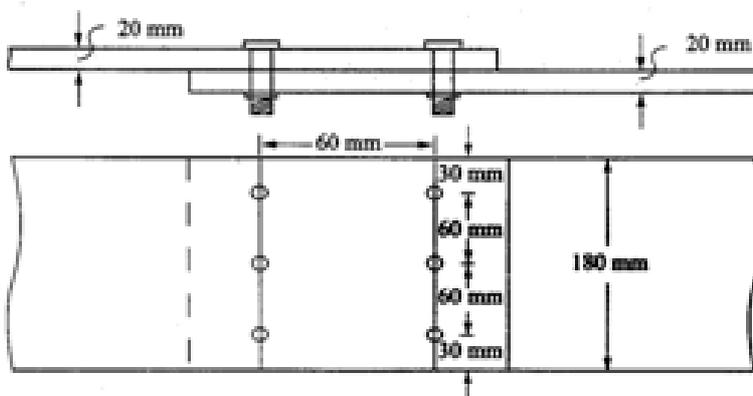
Figure.1

22.	Determine the tensile strength of a roof truss diagonal tension member 100mm x75mm x 10mm. The longer leg is connected to the gusset plate with 20mm diameter bolts in one row. Number of bolts used is 6, the edge distance = 30mm and pitch = 50mm.	CO2 [K4]
23.	An ISMB400 is used as a column. It is laterally supported in the plane of the major axis at a height of 3.5m and in the plane of minor axis at a height of 7m. the ends may be assumed as hinged. Determine the allowable load on the column.	CO2 [K4]
24.	A tie member of a roof truss consists of 2 ISA90x60x10mm angle sections. The angles are connected on either side of 12mm gusset plates and the member is subjected to a factored load of 500 kN. Design the welded connection. Assume the welding is done in the workshop.	CO1 [K4]
25.	An ISMB 350 section is used as a beam section for a simply supported beam of span length 8m. The compression flange of the beam is laterally restrained. Determine the Design moment capacity of the above section.	CO3 [K4]
26.	A roof truss shed is to be built in Lucknow. The size of the shed is 25m x 50m. the height of the building is 12m at the eves level. Determine the basic wind pressure.	CO4 [K4]
27.	Determine the safe axial load carrying capacity in compression of the light gauge channel (C) section shown in Figure.2. The effective length of the member is 3m. Yield strength of steel f_y = 240 N/mm^2.	CO6 [K3]

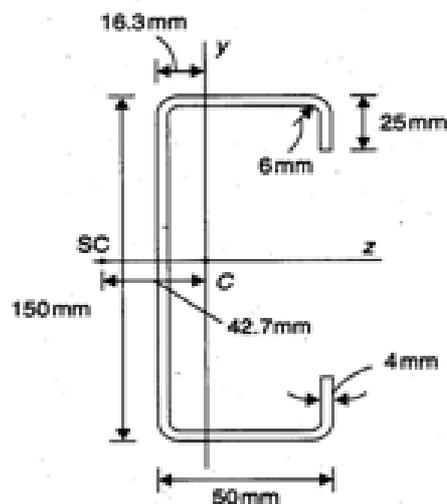

Figure.2

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