Reg. No.															

Question Paper Code	13158

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Sixth Semester

Civil Engineering

20CEPC601 - DESIGN OF STEEL STRUCTURES

Regulations - 2020

(Use of IS 800 – 2007 & Steel Tables is permitted)

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	Poisson's ratio of structural steel in elastic range is _____. (a) 0.3 (b) 1.5 (c) 1.1 (d) 1.25	*1*	*K1*	*CO1*
2.	Which of the following format is used in limit state method? (a) Single safety factor. (b) Multiple safety factor. (c) Load factor. (d) Wind factor.	*1*	*K1*	*CO1*
3.	Prying forces are _____. (a) Friction forces. (b) Shear forces. (c) Tensile forces. (d) Bending forces.	*1*	*K1*	*CO1*
4.	What is the yield strength of bolt of class 4.6? (a) 400 N/sq.mm. (b) 240 N/sq.mm. (c) 250 N/sq.mm. (d) 500 N/sq.mm.	*1*	*K1*	*CO2*
5.	Proof stress for minimum bolt tension is _____ times of ultimate tensile stress of the bolt. (a) 0.5 (b) 0.6 (c) 0.7 (d) 0.8	*1*	*K1*	*CO2*
6.	The minimum size of weld for the thickness of thicker member upto 20 mm is _____. (a) 3 mm (b) 5 mm (c) 6 mm (d) 10 mm.	*1*	*K1*	*CO2*
7.	The design strength of tension member corresponding to gross section yielding is given by_____. (a) $\gamma_{m0} f_y A_G$. (b) $\gamma_{m0} f_y / A_G$. (c) f_y / γ_{m0}. (d) $f_y A_g / \gamma_{m0}$.	*1*	*K1*	*CO3*
8.	The strength of tensile members is not influenced by _____. (a) Length of connection. (b) Net area of cross section. (c) Type of fabrication. (d) Length of plate.	*1*	*K1*	*CO3*
9.	Bars and rods are not used as _____. (a) Tension members in bracing systems. (b) Friction resistant members. (c) Sag rods to support purlin. (d) To support girts in industrial buildings.	*1*	*K1*	*CO3*
10.	The compression member falls under buckling class "b", the imperfection factor is ____. (a) 0.21 (b) 0.34 (c) 0.49 (d) 0.76	*1*	*K1*	*CO4*
11.	The thickness of flat lacing bars shall not be less than _____ of its effective length for single lacing system. (a) one-fortieth. (b) one-fiftieth. (c) one-sixtieth. (d) one-eightieth.	*1*	*K1*	*CO4*
12.	The effective length of battened column is increased by _____. (a) 5% (b) 10% (c) 15% (d) 20%	*1*	*K1*	*CO4*
13.	Imperfection factor for rolled section is _____. (a) 0.21 (b) 0.1 (c) 2.1 (d) 0.34	*1*	*K1*	*CO5*
14.	The most critical location for failure due to web crippling is _____. (a) Flange cross section. (b) Middle of web. (c) End of flange. (d) Root of fillet.	*1*	*K1*	*CO5*
15.	The effect of lateral-torsional buckling need not be considered when _____. (a) $\lambda_{LT} < 0.4$ (b) $\lambda_{LT} \geq 0.4$ (c) $\lambda_{LT} = 0.4$ (d) $\lambda_{LT} \leq 0.4$	*1*	*K1*	*CO5*
16.	Intermediate vertical stiffeners are provided in plate girders to _____. (a) Eliminate the web buckling. (b) Eliminate the local buckling. (c) Transfer concentrated loads. (d) Prevent excessive deflection.	*1*	*K1*	*CO5*

17. Sag rods are designed as _____. *1 K1 CO6*
(a) Compression members. (b) Laterally supported beams.
(c) Tension members. (d) Laterally unsupported beams.

18. While erecting channel section purlins, it is desirable that they are erected over rafter with their flange is _____. *1 K1 CO6*
(a) Facing down slope. (b) Facing up slope.
(c) Does not depend whether up slope or down slope. (d) Flanges are placed randomly.

19. The gantry girders carrying electrically operated overhead travelling cranes, the lateral forces are increased by _____ for impact allowance. *1 K1 CO6*
(a) 10% of weight of crab and weight lifted on the crane.
(b) 20% of weight of crab and weight lifted on the crane.
(c) 25% of maximum static wheel load.
(d) 50% of maximum static wheel load.

20. What demands for disuniting the pre-engineered structures? *1 K1 CO6*
(a) Less weight. (b) Quality.
(c) Transportation and placing of structures. (d) Design constraints.

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. Draw a neat sketch of ISMB 250 and mention its various properties. *2 K2 CO1*

22. Write the advantages of high strength bolts. *2 K1 CO1*

23. Distinguish between the pitch and staggered pitch. *2 K2 CO2*

24. Write the equation for calculating the effective throat thickness of a weld. *2 K1 CO2*

25. Recall the term"shear lag". *2 K1 CO3*

26. What are the main objectives of the lug angles? *2 K1 CO3*

27. Define slenderness ratio. *2 K1 CO4*

28. State the functions of column bases. *2 K1 CO4*

29. Name the components of a plate girder. *2 K1 CO5*

30. What is the permissible deflection for electrically operated overhead crane capacity upto500 kN? *2 K1 CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31. a) Discuss about the different structural steel products. *10 K2 CO1*

OR

b) Draw a typical stress-strain for mild steel and explain the salient points on it. Also explain the mechanical properties of mild steel *10 K2 CO1*

32. a) A 100 mm x 10 mm plate is to be welded to another plate 150 mm x 10 mm by fillet welding on three sides. The size of the weld is 6 mm. Find out necessary overlap of the plate, for full strength of the joint. Consider shop weld. *10 K3 CO2*

OR

b) A tie member consisting of an angle section ISA 100 × 100 × 8 is welded to a 10 mm thick gusset plate. Design the welds to carry a factored load of 200 kN. Consider site weld. *10 K3 CO2*

33. a) A tie member consisting of angle section ISA 100 × 100 × 8 is bolted to a 10 mm thick gusset plate. Use M20, 4.6 grade bolt. Calculate the load carrying capacity of the section. *10 K3 CO3*

OR

b) Design a suitable angle section to carry tensile force of 220 kN. Use welded connection. *10 K3 CO3*

34. a) Calculate the design axial load carrying capacity of the column ISMB400, if the effective length of column is 3 m. *10 K3 CO4*

OR

b) Design a slab base for a column ISHB300 @ 577 N/m carrying an axial load of 1000kN. M20 grade concrete is used for the foundation. Provide welded connection between column and base plate. *10 K3 CO4*

35. a) Design a simply supported laterally restrained beam of effective span 5 m carrying a factored UDL of intensity 8 kN/m throughout its length. Design an appropriate beam section using Fe410 grade steel. Bearing length = 200 mm. *10 K3 CO5*

OR

b) Write down the step by step procedure for the design of welded plate girder. *10 K3 CO5*

36. a) Write down the step by step design procedure of crane supporting gantry girder with suitable codal specifications. *10 K3 CO6*

OR

b) Design a channel purlin for the following data. *10 K3 CO6*

- Spacing of truss = 5.0 m
- Spacing of purlin = 1.1 m
- Dead and live load from roof = 0.6 kN/m^2
- Wind pressure (Upward) = 1.2 kN/m^2
- Slope of the main rafter = 12º