Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

ADVANCED DESIGN OF STEEL STRUCTURES - [CIE 5418]

II SEM M. Tech Structural Engineering.- END SEM EXAM MAY 2024

Date- 2024 Duration: 3Hrs Marks 50

Note: Answer all questions. Assume Fe410 steel with fy=250N/mm^2 if not given.
Assume missing data suitably. IS 800-2007 and SP6 is permitted.

1.A	Determine the size and spacing of the fillet weld to connect the flange and web of laterally supported beam carrying factored shear force 2000KN. Given (web size 16mm x2000 mm), flage size (650 mm x 40mm).	**4**	**CO1**
1.B	Determine the load carrying capacity of a bar strut with effective length of 2.5 m having solid rectangular section 140 mmx48 mm of grade Fe410 steel. What will be the load carrying capacity, if the bar is divided into 4 pieces of 140 mmx12 mm each and welded to form a hollow section with external size 152 mm x 152 mm	**3**	**CO4**
1.C	A simply supported thin web plate girder 18 m in span and laterally restrained throughout. It must support a uniform service load 50 kN/m throughout the span. Determine only the flange and web size of the plate girder without intermediate stiffeners.Assume K=190Ɛ	**3**	**CO3**
2.A	ISHB 300@63kg/m used as a Biaxial industrial column of unsupported length **4.5m** subjected to following loads and moments: Factored axial load **600kN**, Factored moment Mz @ top **35 kN-m**, Factored moment Mz @bottom **50 kN-m**, My @ top 10 kN-m, Factored moment My @bottom 20 kN-m assume effective length of column as **0.8L**. Check for buckling resistance and Check for Combined Axial Force is not required . Carryout check for overall buckling failure only. Given Mdz=196kN-m and Mdy=35 kn-m.	**5**	**CO1**
2.B	Determine the design adequecy in bending ,of a steel ISMC200 purlin section 5m length subjected to factored $M_{Z=}$12.5 kN-m, M_y =1.67 kN-m .	**5**	**CO2**
3.A	Determine number and spacing of shear connectors used in composite bridge to transfer a vertical shear of 700kN. Given: Spacing of girders 2.2m c/c. Thickness of the slab is 350mm and M25 Grade concrete. Flange Size (550x40) mm at top and bottom. Web size(10x1200) mm C.G of the composite section is at a distance 230mm from the top of RCC slab. Assume 16mm diameter steel connectors.	**4**	**CO4**
3.B	Determine the critical bending moment and shear force acting on a steel Purlin ISMC150 for (DL+WL) load combination. Given weight of the AC sheets =200 N/m^2 Live load =1250 N/m^2 Wind load in X direction= -2 kN/m Span of the truss= 25 m Slope theta-10 degree. Spacing of the purlin =1.5 m	**3**	**CO2**

	Truss spacing =4.0 m		
3.C	Derive the equation to calculate change in the sag of a transmission line cable due to temperature.	**3**	**CO5**
4.A	ISHB250 @51kg/m used as industrial column of height 4.1 m, subjected to factored axial load 500kN and maximum factored moment Mz=45kN-m at bottom and Mz=27 kN-m at top. Assume effective length 0.8 L. check the safety of the column for resistance to combined axial force and bending moment (as per 9.3.1-IS 800).	**5**	**CO1**
4.B	Evaluate the height required for the transmission line tower, given the following particulars. Single circuit three phase transmits 50MW, 50Hz for 250KV, power factor 0.70, Voltage transmitted 140KV power conductors are of ACSR type 28mm nominal dia, weight of the conductor 20N/m. Permissible maximum tension is 35kN. Youngs modulus $0.85x10^5 N/mm^2$ and co-efficient of thermal expansion=0.00002000/^oC. Shape factor for the cable is 0.65. Ground wire 10mm nominal diameter, permissible tension 25 kN. Vertical clearance for conductor is 6.0 m above G.L. Minimum vertical spacing between the conductors is 3.75 m minimum. Horizontal spacing between the conductors 6.50 m. Height of the ground wire above top most power conductor is half the horizontal spacing of the conductor. Minimum and maximum temperatures are 5^0 and 60^0. Wind pressure at site $1.8kN/m^2$. Weight span of the tower is 200 m.	**5**	**CO5**
5.A	Explain with a neat sketch different design span lengths considered in the design of transmission line towers.	**5**	**CO5**
5.B	Discuss the design assumptions considered while configuring the transmission line tower.	**5**	**CO5**