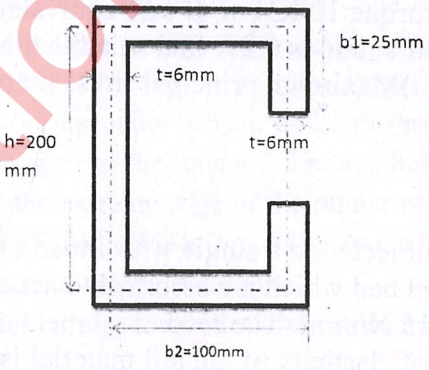
civil sem-V sub: ASM R-19. 'C' Scheme 13-06-25

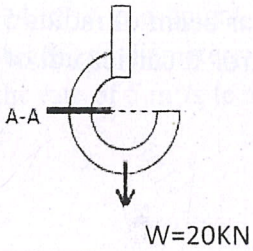
(3 Hours) Total Marks : 80

Attempt any **FOUR** questions.
Assume suitable data wherever necessary.
Figures to the right indicate full marks.

Q.1	Solve **any four**	**20**
a	Determine the position of NA" ro" for rectangular section bxd used as curved bar.	**5**
b	Calculate IUU and IVV for 80x80x10 mm angle section. Also locate the axis UU and VV	**5**
c	Define shear flow. Sketch shear flow for symmetrical channel and un-symmetrical I section.	**5**
d	Why curved beam in plan has to be designed for a combined effect of torsion, bending moment and shear force?	**5**
e	Explain Maximum Principal Stress Theory.	**5**
f	Determine form factor fs for rectangular section.	**5**
Q.2		**20**
a	A simply supported beam having 3m span is of rectangular cross section 100x200 mm deep. The beam supports a concentrated load of 2000 N at the centre of the span.The plane of loading is inclined at an angle of 30 degree to the vertical axis of symmetry. Calculate bending stresses at the central section of the beam.	**10**
b	Locate the shear centre for the given fig.Thickness of the section is same.b1=25mm, ,h=200mm and thickness = 6mm .Section is symmetrical about X-X axis(horizontal)	**10**



Q.3		**20**
a	Determine the stresses at the principal horizontal diameter section A-A of a crane hook as shown in the figure; it supports a load of W= 18 KN. The diameter of the circular section is 50 mm and the radius of curvature is 100 mm.	**10**



QP code.

b A steel shaft is to be design to support a tensile force of 30 KN and subjected to a torsional moment of 2.0 KNm .Using factor of safety of 1.5 and E=210KN/mm^2 and yield stress 6y=200 N/mm^2.Design the diameter of the shaft using maximum shear stress theory. **10**

Q.4 **20**

a Determine the intensity of foundation pressure below a continues concrete footing of infinite length at intervals of 5m, over a length of 50m due to a concentrated load of 1500 KN acting at the centre of the length. Also, evaluate the total pressure beneath the footing due to live and dead loads assuming the spring constant of the soil as 5 N/mm^2, section of concrete footing 1.10m x 1.10m, modulus of elasticity of concrete footing is 20 KN/mm^2. Sketch the total pressure variation below the footing. **10**

b A curved beam of 100mm x2000mm and of mean radius of curvature is 100 mm is initially unstressed. If a bending moment of 15 KNm is applied to the bar and tends to straighten it, find the stresses at the inner and outer face of the beam section. If the beam is straight then, what are the stresses in beam section? **10**

Q.5 **20**

a Consider a simply supported beam of span L with a point load W KN at the centre of the beam .The cross section of the beam is rectangular with width b and depth D .Determine the ratio of deflection due to shear and bending for D/L= 1/1,1/2,1/5and 1/10. Take E = 2.6G. **10**

b A circular steel shaft is subjected to combined bending & torsion, the bending moment being 10 KN m & torque 10 KN m. If safe equivalent stress is simple tension is 200 N/mm^2 and Poisson's ratio is 0.25, find suitable diameter of the shaft based on the following theories :i)Maximum principal stress theory; ii) Maximum Principal strain theory; **10**

Q.6 **20**

a A rail road rail is subjected to a single wheel load of 100KN. The rail is supported by ties, ballast and road bed which are assumed to act as an elastic foundation with a spring constant of 15 N/mm^2. The second moment of area of rail section is 360 x 10^5 mm^4 and modulus of elasticity of the rail material is 200 KN/mm^2. The rail section is 180mm deep with a centroid located at 105mm from the top. Estimate the maximum bending moment, deflection and bending stress developed in the rail. **10**

b A semi-circular beam of radius 5 m is supported on three columns, one at each end and other at centre. It carries udl of 12KN/m. Determine maximum SF, BM and TM in the beam. **10**