SHRI MATA VAISHNAV UNIVERSITY KATRA

MECHANICAL ENGINEERING DEPARTMENT

Subject: MEL 2014 **Strength of Materials** **Sept. 2017**

Max. Marks: 20 **Minor – I** **Time: 1Hr.**

Note Assume reasonable values of missing data:

Q1) A steel pipe is filled with concrete and subjected to a compressive force of 80kN as shown in Fig.1. Determine the stress in concrete and the steel due to this loading. The pipe has an outer diameter of 70 mm. E_{st} = 200 Gpa and E_c = 24 GPa. (05)

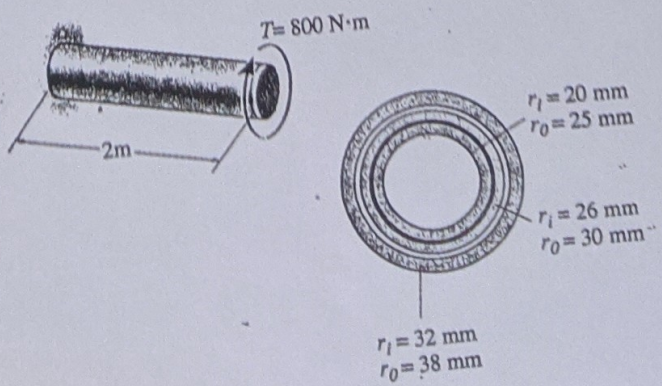
OR

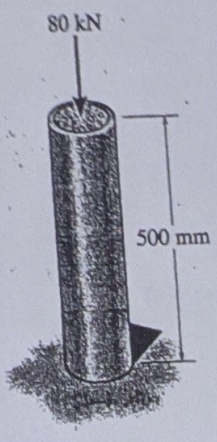
Q2) A shaft consists of three concentric tubes, each made from the same material and having the inner and outer radii shown in Fig.2. If a torque of T = 800N.m is applied to the rigid disk fixed to its end, determine the maximum shear stress in the shaft. (05)

Q3) Stress state at a point is σ_x= - σ_y= 300 Mpa and τ_{xy}= 400 MPa. Determine

1. Principle stresses, (1,1,1,2)
2. Maximum shear stress and (1,1,1,2)
3. State of stress on the plane which is rotated by an angle of 30^0 CCW using Mohr's circle. (1,1,1,2)

In all these cases also draw the elements and show the stresses on it.





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MECHANICAL ENGINEERING DEPARTMENT

Entry	No.	1	6	B	M	E	0	8	7

Subject: MEL 2014 **Strength of Materials** **Oct. 2017**

Max. Marks: 40 **Minor – II** **Time: 1Hr.**

Note: Assume reasonable values of missing data.

Q1) Derive the relationship between E, G and ν. (5)

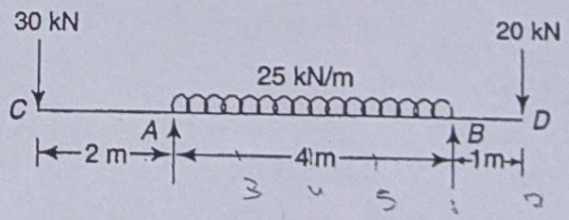
Q2)

a) Draw shear force diagram for the beam shown in the figure. (3)

b) Draw bending moment diagrams for the beam shown in the figure. (8)

c) What is the value of maximum bending moment in the beam? (1)

d) At what stations is bending moment zero? (3)



Subject: MEL 2014 **SOM** **Aug. 2018**
Max. Marks: 40 **Minor - I** **Time: 1.5 Hrs.**

Note:

1. Assume reasonable values of missing data.
2. Mobile phones are not allowed. Hand over these to the invigilation staff.

Q1) A bar **12mm** in diameter, is acted upon by an axial load of **20kN**. The change in diameter is measured as **0.003mm**. Determine the Poisson`s ratio. Modulus of Elasticity and bulk modulus. The value of modulus of Rigidity is **80G Pa**. **(4,3,3)**

Q2) A steel rod of **30mm** diameter is enclosed in a brass tube of **42mm** external diameter and **32mm** internal diameter. Each bar is **360mm** long and the assembly is rigidly held between two stops **360mm** apart. The temperature of the assembly is then raised by **50°C**. If $E_S = 205Gpa$, $E_B = 90Gpa$, $\alpha_S = 11x10^{-6}/°C$ and $\alpha_B = 19x10^{-6}/°C$ then determine

i) Stresses in the tube and the rod if supports do not yield, **(3,3)**
ii) Stresses in **the** tube and the rod if supports yield by **0.15mm**. **(4,4)**

Q3) Find the principal stress state and maximum shear stress state for the following state of stress:

$\sigma_X = 500$ MPa; $\sigma_Y = -300$ MPa; $\tau_{XY} = 300$MPa **(8,8)**

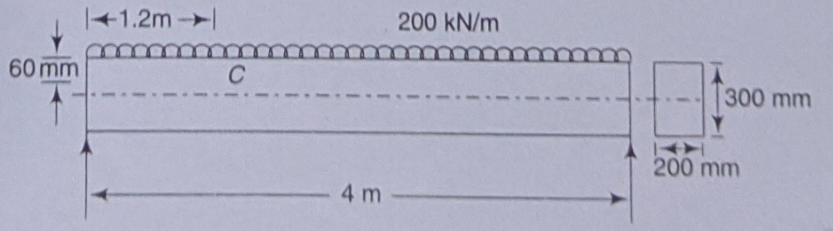
Subject: MEL 2014	**SOM**	**Oct. 2018**
Max. Marks: 20	**Minor - II**	**Time: 1.5 Hrs.**

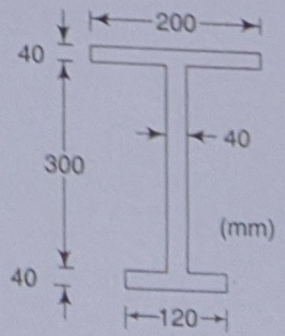
Note:

1. Assume reasonable values of missing data.
2. Mobile phones are not allowed. Hand over these to the invigilation staff.

Q1) Figure 1 shows a simply supported beam carrying a uniformly distributed load. Determine the normal bending stress at point **'C'** of the beam which is **60mm** below the top surface and **1.2m** from the left support. Also draw the normal stress distribution across the depth of the beam at section passing through **'C'**. **(5, 1)**

Q2) A cast iron beam of I – section, shown in Figure 2, is subjected to a shear force of **150kN**. Sketch the shear stress distribution over the depth of the section. **(14)**





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MEL 2014	Strength of Materials	Sept., 2019
Time 1.5 Hr	MINOR	Marks 20

Note: All questions carry equal marks. Mobile phones are not allowed in the examination hall.

Q1) An assembly of a steel bar of 60mm diameter enclosed in an aluminium tube of 70mm internal diameter and 110mm external diameter is compressed between two rigid parallel plates by a force of 300 kN. The length of the assembly is 1m. Determine the stresses in the bar and the tube if $E_S = 200Gpa$ and $E_a = 70Gpa$. (5,5)

Q2) At a certain point in a strained material the state of stress is (120, -90, τ). The maximum normal stress at the point is 150 MPa. Determine

a) the value of shear stress τ, (4)
b) the maximum shear stress at the point, (2)
c) State of stress at 22.5^0 CW to the given state of stress. (4)

Q3) A 5m long SS beam has its supports 4m apart, the overhang being on the left end. It carries a uniform load of intensity 60 kN/m. Draw the shear force and bending moment diagrams of the beam. (4,6)

SHRI MATA VAISHNAV DEVI UNIVERSITY
MECHANICAL ENGINEERING DEPARTMENT

Entry	No.	1	8	B	M	E	0	4	4

Subject: MEL 2014 **SOM** **Dec. 2019**
Max. Marks: 50 **Major** **Time: 3 Hrs.**

Note:

1. *Assume reasonable values of missing data.*
2. *Mobile phones are not allowed. Hand over these to the invigilation staff.*

Q1) Answer the following:

a) Derive the relationship between Bending moment, Shear force and Load of a beam
b) What are the assumptions in simple beam bending theory? (3)
c) Write the stress strain relation for 3 - D state of stress. (4)

Q2) A simply supported beam 'AB' of length **L** carries a uniformly distributed load of intensity '**w**' starting from a distance of **L/4** from the left end 'A' and ending **at mid-span**. Deduce the expression for slope and deflection at any point. (10)

Q3) A Cantilever beam of 6m length carries two concentrated loads of **5 kN** and **10 kN** at a distance of **2m** and **4m** respectively from the built-in end. Determine the maximum deflection by moment area method. (10)

Q4) The outer and inner diameters of a hollow steel shaft are **120mm** and **60mm** respectively. The shaft transmits **800 kW** at a speed of **400 rpm**. Determine the bending moment which can be safely applied to the shaft if the maximum principal stress is not to exceed **80 MPa**.

Q5) A **4m** long circular bar deflects **20mm** at the centre when used as a simply supported beam under a **200N** load at the Centre. Determine critical load for the same bar when used as a column pinned at both the ends. (10)

CO 1	Are able to draw internal forces diagrams of structure members.	Q2, Q3
CO 2	Have learnt to draw free body diagram of structural members.	Q1, Q2, Q3
CO 3	Are able to analysis various structural members subjected to different loads.	Q2, Q3, Q4, Q5
CO 4	Are able to calculate stress and strains of structural members.	Q4, Q5