Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

I SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV 2017

SUBJECT: MECHANICS OF SOLIDS [CIE 1001]

REVISED CREDIT SYSTEM
(22/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Locate the resultant of force system acting on a body as shown in **fig. 1**, with respect to point 'B'.	**5**
1B.	Determine the support reactions at 'A' and 'B" for a beam shown in **fig. 2**	**5**
2A.	What is the force 'W' required to stop the block 'B' moving upwards (**fig. 3**), if weight of block 'A' is 150 N. Co efficient of friction for all contact surfaces is 0.3.	**5**
2B.	Determine the moment of inertia of a geometrical **fig. 4**, with respect to the axis **'A-B'**	**5**
3A.	A block is subjected to forces as shown in **fig.5.** If E = 115 MPa and $\mu = 0.35$, determine the change in volume. What change must be made to the 250 kN force so that the total strain is zero.	**3**
3B.	Determine the total change in length of bar shown in **fig. 6**. Details of the segments as follows, ***Segment*** / ***Cross sectional details*** / ***Elastic modulus*** AB (Tapered bar with circular cross section) / Diameter varies from 20 mm to 40 mm / 100 GPa BC / 1450 mm^2 / 70 GPa	**2**
3C.	Derive a relationship between young's modulus of elasticity (E) and modulus of rigidity (G)	**5**
4A.	A compound bar is made up of two steel bars and a copper bar carries a weight of 150 kN as shown in **fig. 7**. If the temperature is raised by 50°C, Determine the load carried by each bar. Consider, $\alpha_{st} = 1.1 \times 10^{-5}/^{o}C$. $\alpha_{cu} = 2 \times 10^{-5}/^{o}C$. $E_{st} = 210$ GPa, $E_{cu} = 100$ GPa	**5**
4B.	Derive an expression for the total deformation of a tapered bar of rectangular cross section of uniform thickness (b). Depth of the bar varies from 'd_1' to 'd_2' ($d_1 < d_2$) over a length 'L' subjected to an axial load 'W'	**5**
5A.	A cylinder of 750 mm diameter and 2 m in length has to sustain an internal pressure of 2 N/mm^2. If permissible tensile stress is 30 N/mm^2, permissible shear stress is 10 N/mm^2 and permissible change in diameter is 0.45 mm, find the minimum thickness of the metal required. Consider E = 70 GPa and $\mu = 0.25$	**5**
5B.	Draw shear force and bending moment diagram for the beam shown in **fig 8**. Also, locate the point of contra flexure, if any.	**5**

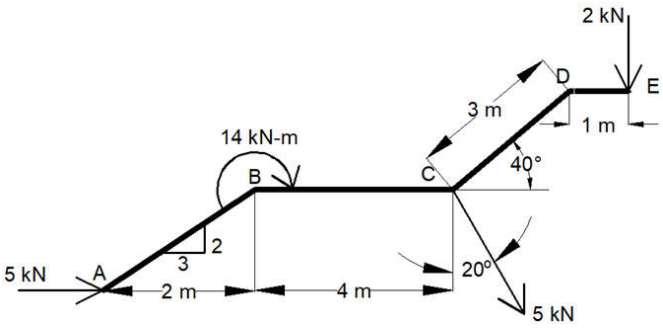

Fig. 1 (Q. No. 1A)

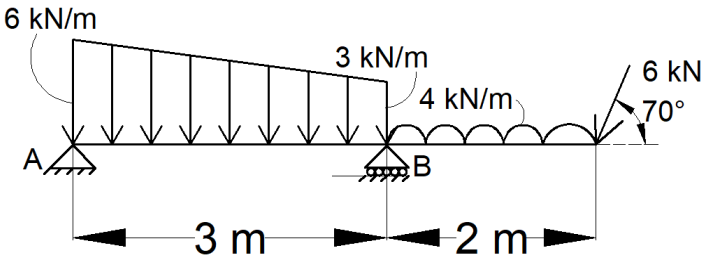

Fig. 2 (Q. No. 1B)

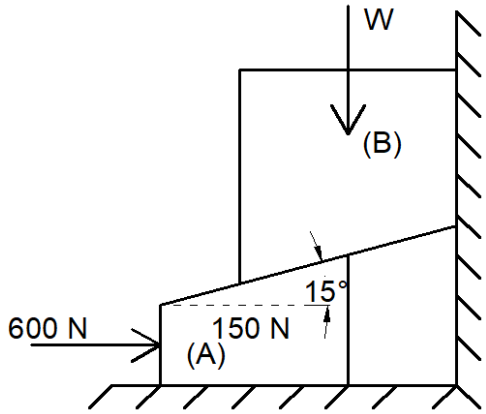

Fig. 3 (Q. No. 2A)

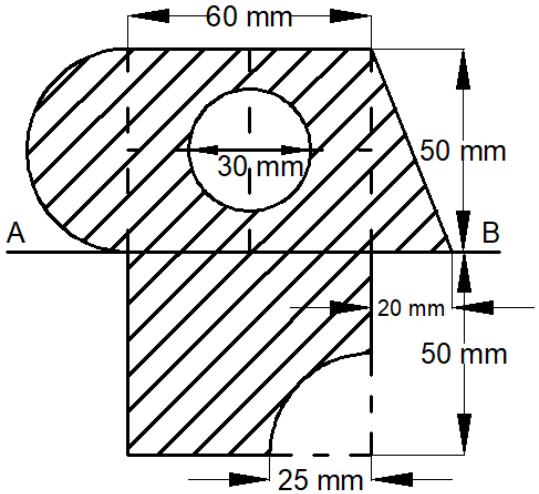

Fig. 4 (Q. No. 2B)

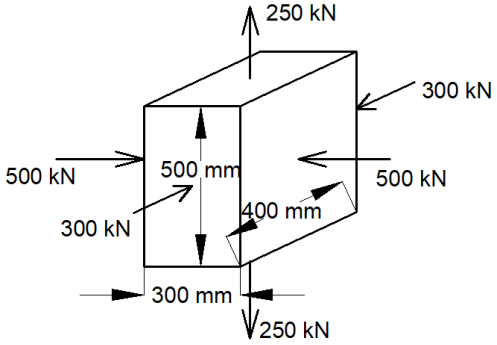

Fig. 5 (Q. No. 3A)

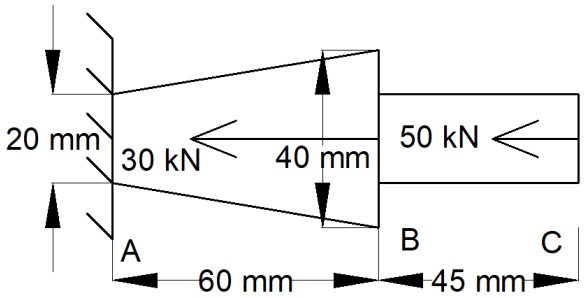

Fig. 6 (Q. No. 3B)

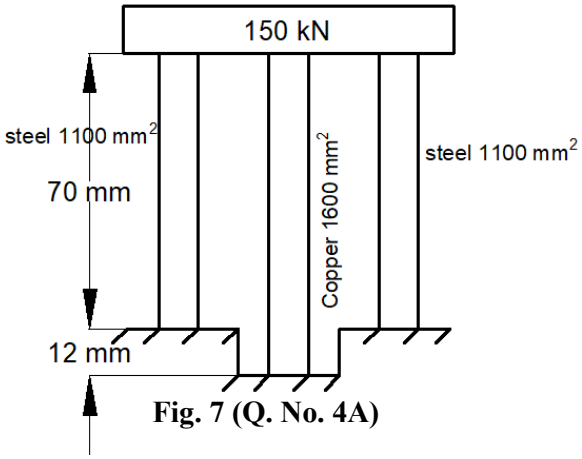

Fig. 7 (Q. No. 4A)

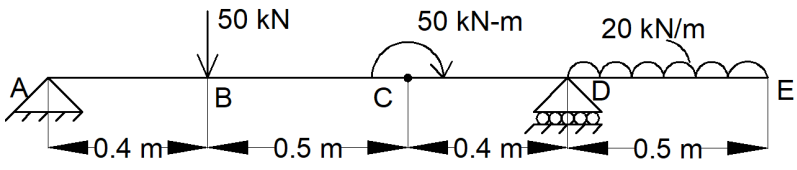

Fig. 8 (Q. No. 5B)