Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER B.TECH.

END SEMESTER EXAMINATIONS, APR/MAY 2017

SUBJECT: MECHANICS OF SOLIDS [CIE 1001]

REVISED CREDIT SYSTEM
(24/04/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	State and prove Varignon's theorem.	**02**	**CO1**
1B.	Find P,Q and C, for the force system shown in the **Fig. 1B** if the resultant couple is 60N-m anticlockwise	**03**	**CO1**
1C.	Find the reactions at the supports A and B for the beam loaded as shown in **Fig. 1C**	**05**	**CO1**
2A.	The uniform pole of length L and weight W is placed against the supporting surfaces shown in **Fig. 2A**. If the coefficient of friction is 0.25 at both A and B, determine the maximum angle α at which the pole can be placed before it begins to slip.	**05**	**CO1**
2B.	Determine second moment of area of the shaded portion shown in **Fig. 2B** with respect to axis 'AB'.	**05**	**CO2**
3A.	A block of size 150mm x 100mm x 75mm is subjected to a force of 50kN compressive on 100mm x 75mm face, 75kN compressive on 150mm x 100mm face and a tensile force of 100kN on 150mm x 75mm face. Find the change in each dimension and change in volume. Take $\mu = 0.3$, E = 200GPa.	**05**	**CO3**
3B.	A steel rod of 40 mm diameter is enclosed in a brass tube of 60 mm external diameter and 50 mm internal diameter. Each is 400 mm long and assembly is rigidly held between two plates. The temperature of the assembly is raised by 50°C, determine stresses in tube and rod if one of the plate yields by 0.15 mm. Consider, $E_{br} = 1.05 \times 10^5$ N/mm^2, $E_{st} = 2 \times 10^5$ N/mm^2; $\alpha_{br} = 21\times10^{-6}$ /° C, $\alpha_{st} = 12\times10^{-6}$ /° C	**05**	**CO3**
4A.	A composite bar consist of three segments made up of bronze, steel and aluminium fixed at one end as shown in **Fig. 4A** Axial loads are applied at the positions indicated. Determine the stresses in each segment and the total deformation. Given E_{Br} = 100GPa , E_{Al} = 70GPa , E_{St} = 200GPa.	**05**	**CO3**
4B.	Derive an expression for the total extension of the tapered bar of circular cross section with d_1 and d_2 as diameters with length 'L', when subjected to an axial tensile load of P.	**03**	**CO3**
4C.	Explain the following a) Temperature stress b) Joint efficiency	**02**	**CO3** **CO4**

5A.	A thin cylindrical shell 1 m in internal diameter, 3m long has metal thickness 10 mm. It is subjected to internal fluid pressure of 3MPa. Determine (i) Change in diameter (ii) change in length (iii) change in volume. Given: E= 210GPa and μ= 0.3	**03**	**CO4**
5B.	Draw SFD and BMD for the beam shown in **Fig. 5B**. Locate the point of contraflexure if any.	**07**	**CO5**

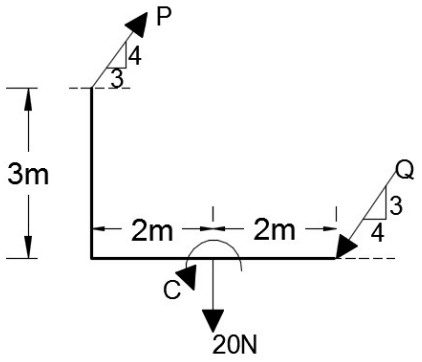

Fig. 1B

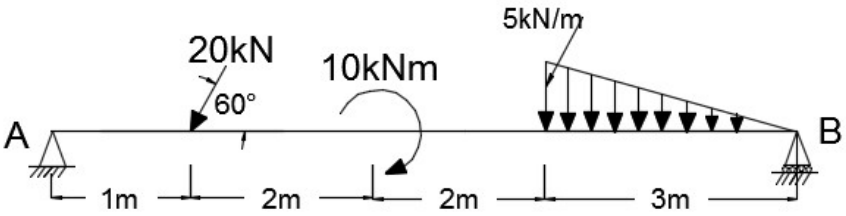

Fig.1C

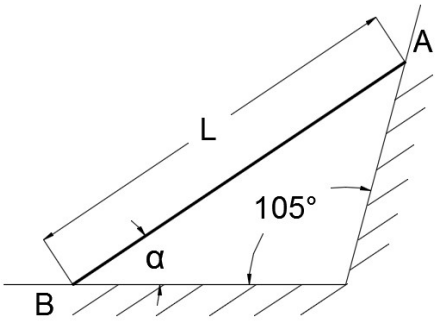

Fig. 2A

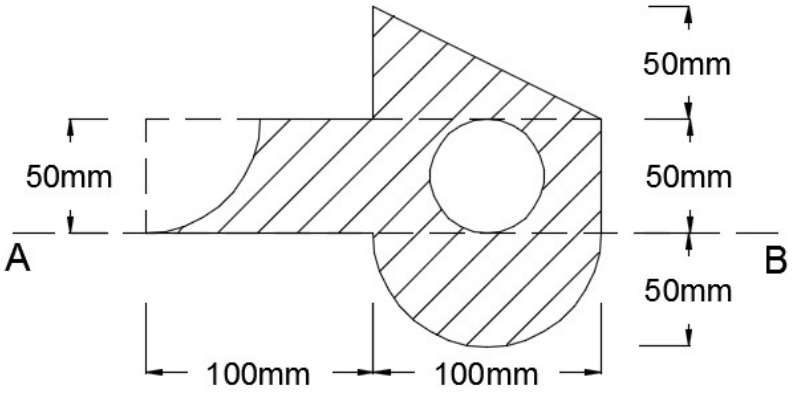

Fig. 2B

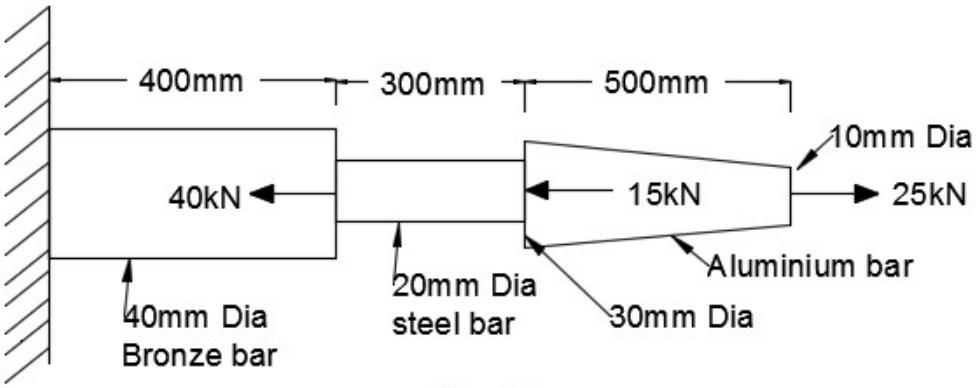

Fig. 4A

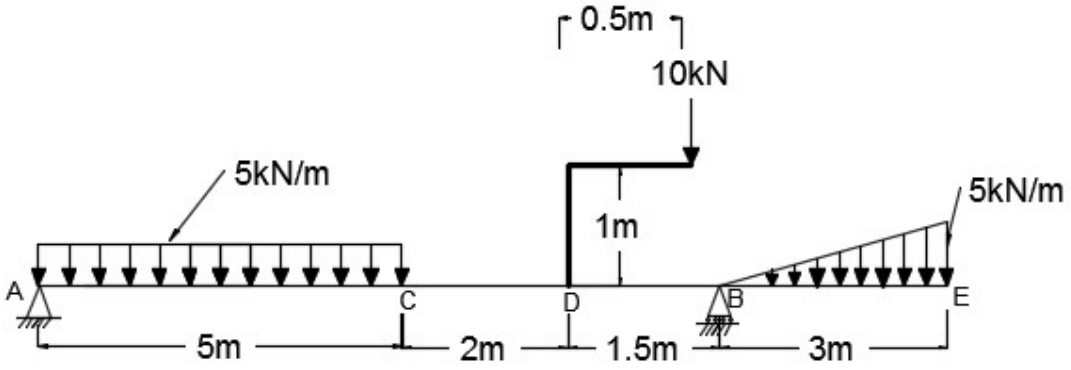

Fig. 5B