

INTERNATIONAL CENTRE FOR APPLIED SCIENCES MAHE, MANIPAL **B.Sc.** (Applied Sciences) in Engg. End – Semester Theory Examinations – Nov./ Dec. 2020 **I SEMESTER - MECHANICS OF SOLIDS (ICE 111)** (Branch: Common to all)

Time: 3 Hours	Date: 24 November 2020	Max. Marks: 50
✓ Answer ALL the q✓ Missing data, if any	uestions. y, may be suitably assumed	
1A. Explain (i) Temperati	re Stress (ii) Compound bar.	(03)

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1B. A square prism of wood 50mm x 50mm in cross section and 300mm long is subjected to a tensile stress of 40MPa along its longitudinal axis and lateral compressive stress of 20MPa on one of the lateral face and a lateral tensile stress of 10MPa on the other lateral face. Find the change in dimensions of the prism and the change in volume. Take Poisson's Ratio as 0.4 and E as 1.5×10^4 N/mm^2 . (07)

2A. State and prove parallel axis theorem of Moment of Inertia. (03)

2B. Determine the MI of the section shown in Fig. about its centroidal axes. All dimensions are in mm



3A. Explain with sketch the (i) Principle of Transmissibility (ii) Force-Couple system (04)

3B. Determine the resultant completely and locate it along DC of the system of non-concurrent forces shown in Fig. Take the size of grid as 1mx1m. (06)

(07)



4A. Determine the support Reactions for the beam loaded as shown in the Fig.



4B. A cylindrical pressure vessel is fabricated from steel plate having thickness 20mm. The diameter of the pressure vessel is 450mm and its length 2m. Determine the maximum internal pressure that can be applied if the longitudinal stress is limited to 140MPa and the circumferential stress limited to 60Mpa. Assume circumferential and longitudinal joint efficiencies as 60% and 80% respectively. (05)

5A. A body of weight 3kN is resting on a rough plane as shown in the Fig. It is pulled up the plane by means of a light flexible rope running parallel to the plane and passing over a frictionless pulley at the top of the plane. The portion of the rope beyond the pulley hangs vertically down and carries a weight of 1.5kN at the end. Find the tension in the rope, acceleration with which the body moves up the plane, distance moved by the body in 2secs after starting from rest. Take coefficient of friction between the body and the plane as 0.2. (05)



5B. A steel tube of 35mm outer diameter and 30mm inner diameter encloses a gun metal rod of 25mm diameter and is rigidly joined at each end. If at a temperature of 40°C there is no longitudinal stress, determine the stresses developed in the rod and tube when the temperature of the assembly is raised to 240°C. Take $\alpha_s = 11 \times 10^{-6}$ /°C, $\alpha_g = 18 \times 10^{-6}$ /°C, $E_s = 205$ GPa and $E_g = 91.5$ GPa. (05)

(05)