Student Regn. No.

## MEC101: MECHANICAL SCIENCES - I

Time Allowed: 3 Hours

Max. Marks: 100

- This paper contains 8 questions divided in three parts on 3 pages. 1.
- 2. Part A is compulsory.
- 3. In Part B and C taken together (Questions 3 to 8), attempt any 5 questions out of 6.
- Attempt all parts of the questions chosen. 4.
- 5. Answer all questions in serial order.

## **PART-A**

Q1)

a) State Principle of Transmissibility ?	[2]
b) Difference between simply supported beam and continuous beam ?	[2]
<ul><li>c) What are the effects of Torsion and explain torsional rigidity?</li><li>d) Write relationship between shear force, bending moment and external</li></ul>	[2] loading. [2]
e) Define Modulus of Elasticity . Also write its expression.	[2]

## **O2**)

a) The head of a cylinder is held by 8 studs of 6 mm diameter each. The diameter of the cylinder is 200 mm. If the in ternal pressure In the cylinder is 1.5 MP. calculate the tensile stress in each stud. [5] [5]

b) Difference between first and third angle projection?

c) The connecting rod of an engine is of I-cross- section as shown in Fig. below during the return stroke, the compressive force in the rod was 50 kN. Calculate the Compressive stress developed in the rod? [5]



## PART B

**Q3)** A car starts from rest and accelerates uniformly to a speed 72 km.p.h. over a distance of 500 m. Calculate the acceleration and time taken to attain the speed. If a further acceleration raises the speed to 90 Km.p.h. in 10 seconds, find this acceleration and further distance moved. The brakes are now applied to bring the car to rest under uniform retardation in 5 seconds. Find the distance travelled during braking. [15]

**Q4)** A stepped bar is loaded as shown in fig below. Calculate the stress in each part and total elongation. E = 200 GPa.



PART C

**Q5)** Draw the bending moment and shearing forces diagrams for the simply supported beam loaded as shown in fig below. [15]



Q6) A solid shaft is to transmit 300 kW at 80 rpm. The shear stress is not to exceed 60 MPa. Find the shaft diameter. Calculate the percentage saving in weight if this shaft were replaced by a hollow one whose internal diameter equals 60 percent of external diameter. The length, material and maximum shear stress remain the same. [15]

**Q7)** A simply supported beam of span L and stiffness EI carries a Uniformly Distributed Load of W/m length. Derive the relation for slope and deflection of beam. [15]

**Q8**) Draw Front view in direction of X, Top view and Left hand side view in first angle projection of figure below. [15]



teres and the second se