GUJARAT TECHNOLOGICAL UNIVERSITY PDDC - SEMESTER-I-EXAMINATION – SUMMER 2016

Subject Code:X11102Date:04/06/2016Subject Name:ELEMENTS OF MECHANICAL AND STRUCTURALTime:02:30 PM to 05:00 PMTotal Marks: 70

Instructions:

- 1. Attempt any five questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.

Q.1(a) Define: (i) Force (ii) Pressure (iii) Work (iv) Power07(b) Explain working of four stroke petrol engine with neat sketch.07Q.2(a) Explain Carnot cycle on p-v diagram.07(b) Explain the working of four stroke petrol engine with neat sketch.07

- Q.3(a) Give difference between governor and flywheel.07(b) Explain construction and working of window air conditioner with neat sketch.07
- Q.4 (a) Enlist various types of air compressor. Explain any one in detail with neat 07 sketch.
 - (b) Explain construction and working of centrifugal pump with neat sketch. 07
- Q.5 (a) Define: (i) Toughness (ii) Hardness (iii) Proof stress (iv) Volumetric strain 07
 - (b) Determine stress, stain and elongation of a mild steel bar of 20 mm diameter. 07 The length of the bar is 1000 mm. The bar is subjected to an axial pull of 30kN. Take $E = 2 \times 10^5 \text{ N/mm}^2$.
- Q.6 (a) Draw Shear force and Bending moment diagram for a beam shown in fig. 1. 07
 - (b) A steel bar having 30 mm diameter and 2 m length hangs vertically. If a weight of 30 kN falls on the collar at lower end from a height of 20 mm, determine stresses developed in the bar. Also calculate strain energy stored in the bar. Take $E = 2 \times 10^5 \text{ N/mm}^2$.
- Q.7 (a) A Solid circular shaft has a radius of 10 mm, is 4 meters long subjected to a torque of 0.10 kNm. Determine (i) the angle of twist of one end of shaft relative to the other and (ii) the maximum shearing stress within the section. Take $G = 75 \text{ kN} / \text{mm}^2$.
 - (b) At a point in a strained material the stresses on two perpendicular planes are **07** shown in fig. 2. Determine normal stress and tangential stress when $\theta = 30^{\circ}$.

