Enrolment No
--------------

Date:06/05/2016

**Total Marks: 70** 

07

07

## GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER-V. EXAMINATION – SUMMER 2016

Subject Code:X51903

Subject Name: Machine Design -I

Time:02:30 PM to 05:00 PM

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Enumerate the advantages and limitations of forging process.
  (b) Explain Goodman's and Soderberg's diagram with neat sketches.
  07
- Q.2 (a) State the advantages and disadvantages of the chain drive over belt and rope 07 drive.
  - (b) Write the design procedure for a chain drive.

## OR

(b) Two parallel shafts, whose centerlines are 4.8 m apart, are connected by an open belt drive. The diameter of larger pulley is 1.5 m and that of smaller pulley is 1 m. The initial tension in the belt when stationary is 3 kN. The mass of the belt is 1.5 kg/m length. The coefficient of friction between the belt and the pulley is 0.3. Taking centrifugal tension into account, determine the power transmitted, when the smaller pulley rotates at 400 rpm.

## Q.3 (a) Explain the terms related to helical spring: (1) Spring rate (2) Free length (3) Spring index (4) Stress factor

(b) A spring is made from a wire of 1.25 mm diameter. The yield strength of the wire is 750 MPa. For a mean diameter of 12.5 mm and 14 active coils of the spring, determine (i) static load corresponding to the yield point of the material and deflection corresponding to that, (ii) solid height assuming that the ends are squared and ground, (iii) Stiffness of the spring, (iv) Pitch of the wire so that the solid stress will not exceed the yield point. Take C = 0.85 X 10<sup>5</sup> N/mm<sup>2</sup>.

## OR

Q.3	(a)	Prove that the ratio of the driving tensions on the two sides of the pulley is $T_1/T_2 = e^{\mu\theta}$	07
		Where, $T_1$ = Tension in the tight side of the belt	
		$T_2$ = Tension in the slack side of the belt	
		$\mu$ = coefficient of friction between the belt and the pulley	
		$\theta$ = Angle of contact in radians	
	<b>(b)</b>	Engrave the advantages of wire rope over fibre rope.	07
Q.4	(a)	Sketch and explain the different types of ends used for pressure vessels.	07
	(b)	Derive a formula for the thickness of a thin spherical tank subjected to an internal fluid pressure.	07
		OR	
Q.4	(a)	What is Bearing Characteristic number for journal bearing? Explain its dependency on various parameters with graph.	07
	<b>(b)</b>	Explain the factors affecting selection of antifriction bearings.	07
Q.5	<b>(a)</b>	Derive an expression for the torque transmitted by a single plate clutch assuming (i) Uniform pressure theory (ii) Uniform wear theory.	07
	<b>(b)</b>	Establish a formula for the frictional torque transmitted by a cone clutch.	07
		OR	

- Q.5 (a) A differential band brake, as shown in Fig. 1, has a drum diameter of 600 mm and the angle of contact is 240°. The brake band is 5 mm thick and 100 mm wide. The coefficient of friction between the band and the drum is 0.3. If the band is subjected to a stress of 50 MPa, find :
  - 1. The least force required at the end of a 600 mm lever, and
  - 2. The torque applied to the brake drum shaft.



All dimensions in mm.

Fig. 1



(b) Explain internal expanding shoe brake with its neat sketch.

\*\*\*\*\*