

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2151907

Date: 03/05/2017

Subject Name: Design of Machine Elements

Time: 02:30 PM to 05:00 PM

Total Marks: 70

Instructions:

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

		MARKS
Q.1	Short Questions	14
	1 Define Stress Concentration Factor.	
	2 What do you mean by Factor of Safety for Fatigue Loading?	
	3 In which type of material Guest's theory of failure is applicable?	
	4 Write Goodman formula for fluctuating stresses.	
	5 Write the different types belts.	
	6 What is creep in the belt drive?	
	7 How power transmission is affected by centrifugal tension in belt drive?	
	8 Define Spring Rate.	
	9 Which type of spring is mostly used in Gramophone?	
	10 What is surge in spring?	
	11 When pressure vessel is said to be a thin cylindrical shell?	
	12 Which type of stress will induced in wire when a helical compression spring is subjected to axial compressive load?	
	13 Define Longitudinal Stress.	
	14 On which type of stress the design of pressure vessel is based on?	
Q.2	(a) What are the factors affecting endurance strength of materials?	03
	(b) Explain the design consideration of castings process with sketches.	04
	(c) State and illustrate various principal design rules as per casting design.	07
	OR	
	(c) Discuss the importance of selection of materials in machine design.	07
Q.3	(a) What are the important points to be considered while designing the pressure vessels?	03
	(b) Distinguish between circumferential stress and longitudinal stress in a cylindrical shell, when subjected to internal pressure.	04
	(c) A shrink fit assembly formed by shrinking one tube over another, is subjected to an internal pressure of 60 N/mm^2 . Before the fluid is admitted, the internal and the external diameters of the assembly are 120 mm and 200 mm and the diameter of the junction is 160 mm. If after shrinking on, the contact pressure at the junction is 8 N/mm^2 , Determine using Lamé's equations, stresses at the inner, mating and outer surfaces of the assembly after the fluid has been admitted.	07
	OR	
Q.3	(a) Compare the stress distribution in thin and thick walled pressure vessels.	03
	(b) Explain various types of ends used for pressure vessels giving practical applications of each.	04
	(c) Derive Soderberg's equation and state its application to different types of loadings.	07

- Q.4** (a) What is the function of a spring? In which type of springs the behavior is non-linear? **03**
- (b) Explain the following terms of the spring: **04**
(1) Free Length (2) Spring Rate
(3) Spring Index (4) Solid Height.
- (c) Design a helical compression spring for a maximum load of 1000 N for a deflection of 25 mm using the value of spring index as 5. The maximum permissible stress for spring wire is 420 N/mm², and modulus of rigidity is 84 KN/ mm². **07**

OR

- Q.4** (a) The extension springs are in considerably less use than the compression springs, why? **03**
- (b) What is Nipping in a leaf spring? Discuss its role. **04**
- (c) Design a leaf spring for following specification: **07**
Total load = 14 tonnes
Numbers of springs supporting the load = 4
Maximum number of leaves = 10
Span of the spring = 1000 mm
Permissible deflection = 80 mm
Take Young Modulus = 0.2×10^6 N/mm²,
Allowable stress in spring material = 600 N/mm²

- Q.5** (a) Sketch the cross section of a V-belt and label its important parts. **03**
- (b) Explain with the help of neat sketches, the types of flat belt drives. **04**
- (c) A leather belt 9 mm x 250 mm is used to drive cast iron pulley 900 mm in diameter at 336 r.p.m. If the active arc on smaller pulley is 120° and the stress in the tight side is 2 N/mm², Find the power capacity of the belt. The density of leather may be taken as 980 kg/ m³, and co-efficient of friction of lather on cast iron is 0.35. **07**

OR

- Q.5** (a) Explain the effect of centrifugal tension on ratio of driving tensions in brief. **03**
- (b) Derive the expression of a ratio of driving tensions for the flat belt drive. **04**
- (c) Two parallel shafts whose center lines are 4.8 m apart, are connected by an open belt drive. The diameter of the larger pulley 1.5 m and that of smaller pulley 1.05 m. The initial tension in the belt when stationery is 3 KN. The mass of the belt is 1.5 kg/m length. The co-efficient of friction between the belt and the pulley is 0.3 Taking centrifugal tension in to account, calculate the horse power transmitted, when smaller pulley rotates at 400 r.p.m. **07**
