

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI(NEW) – EXAMINATION – SUMMER 2019****Subject Code:2162001****Date:21/05/2019****Subject Name:Design of Mechanisms - I****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

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

		MARKS
<b>Q.1</b>	(a) Mention the applications of various types of springs.	<b>03</b>
	(b) What is mechanical advantage? Explain it in context of various types of levers.	<b>04</b>
	(c) State the Euler's formula. What are the assumptions used to derive this formula? Mention the limitations of Euler's formula.	<b>07</b>
<b>Q.2</b>	(a) Write a short note on Standardization.	<b>03</b>
	(b) What is stress concentration? Suggest various remedies of it.	<b>04</b>
	(c) Write a short note on Factor of safety and Preferred numbers.	<b>07</b>
<b>OR</b>		
	(c) Design a helical compression spring for a maximum load of 1500 N for a deflection of 25 mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84 kN/mm <sup>2</sup> .	<b>07</b>
<b>Q.3</b>	(a) What is bearing pressure? Explain it with at least one engineering application of the same.	<b>03</b>
	(b) A seamless spherical shell, 950 mm in diameter and 10 mm thick is being filled with a fluid under pressure until its volume increases by $120 \times 10^3 \text{ mm}^3$ . Calculate the pressure exerted by the fluid on the shell, taking modulus of elasticity for the material of the shell as 200 KN/mm <sup>2</sup> and Poisson's ratio as 0.3.	<b>04</b>
	(c) Efficiency of self locking screw is less than 50%, why?	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Explain the bolts of uniform strength. Explain methodologies to obtain the uniform strength.	<b>03</b>
	(b) Explain the force analysis for toggle type of screw jack.	<b>04</b>
	(c) Derive the expression for torque required to raise the load in context of power screw.	<b>07</b>
<b>Q.4</b>	(a) Explain the use of key. Mention various failures of it.	<b>03</b>
	(b) Explain the procedure to design a cotter in cotter joint during bending failure.	<b>04</b>
	(c) The shaft running at 180 rpm transmit 300 KW Power. The working condition to be satisfy by the shaft are <ol style="list-style-type: none"> <li>(i) The shear stress must not exceed 55 MPa</li> <li>(ii) The angle of twist must not be more than <math>2^\circ</math> on a length of 16d</li> </ol> Calculate the diameter of shaft. Take $G = 0.85 \times 10^5 \text{ MPa}$	<b>07</b>

**OR**

- Q.4** (a) Differentiate between shaft and Axle. **03**  
(b) How to design a frame of Hacksaw blade? Explain with steps. **04**  
(c) Explain at least three cases which uses bolted joint with rough sketches. Analyze any one case. **07**
- Q.5** (a) Explain the concept of combine loading by considering a suitable engineering application. **03**  
(b) What is shear? Explain various types of it. **04**  
(c) Explain the steps of designing knuckle joint. Draw various resisting area during design steps. **07**

**OR**

- Q.5** (a) What is thin cylinder? Mention its typical uses in engineering field. **03**  
(b) Why Rankine's formula is adopted for all kind of columns? **04**  
(c) Explain the design procedure for designing the lever of a lever loaded safety valve. **07**

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