Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2162001 **Date:04/12/2018**

Subject Name:Design of Mechanisms - I

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	**(a)**	Define 1) volumetric strain 2) Resilience	**03**
	(b)	What is a principal stress? Explain in detail with examples.	**04**
	(c)	Mention the various steps to design a push rod.	**07**
Q.2	**(a)**	What is standardization? Explain importance of it.	**03**
	(b)	Explain various types of levers in context of mechanical advantage with sketches.	**04**
	(c)	Explain Euler's column theory with assumptions and limitations.	**07**
		OR	
	(c)	Explain the various steps of generalized design procedure.	**07**
Q.3	**(a)**	What is slenderness ratio?	**03**
	(b)	Explain: elasticity, compressive stress, fatigue.	**04**
	(c)	A mild steel link, as shown in Fig. by full lines, transmits a pull of 80 kN. Find the dimensions b and t if b = 3t. Assume the permissible tensile stress as 70 MPa. If the original link is replaced by an unsymmetrical one, as shown by dotted lines in Fig. 1, having the same thickness t, find the depth b1, using the same permissible stress as before.	**07**

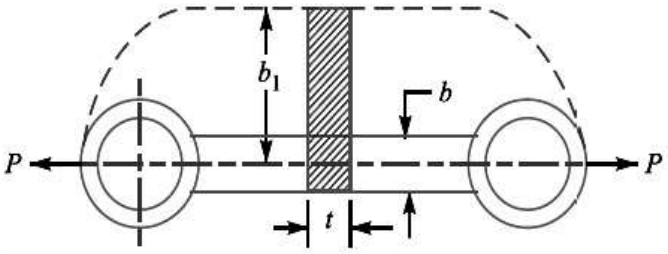

FIG 1.

OR

Q.3	**(a)**	What is mechanical advantage?	**03**
	(b)	Derive the expression in case of composite spring.	**04**
	(c)	Design knuckle joint to connect two rods subjected tensile force 50 KN. The road and pin made of plain carbon steel 30C8. The permissible stress: σ_t = 80MPa σ_c = 80 MPa and τ = 40 MPa.	**07**
Q.4	**(a)**	What is the condition of self- locking of screws?	**03**
	(b)	Explain what you understand by Wahl's factor.	**04**
	(c)	A T – section 150 mm x 120 mm x 20 mm used as a strut of 4 m long hinged at both ends. Calculate crippling load, if young's modulus for material of the section is 200 kN/mm^2.	**07**

OR

Q.4	**(a)**	Why efficiency of square threaded screw is less than 50%?	**03**
	(b)	State various methodologies to obtain the uniform strength.	**04**
	(c)	Find the diameter of solid shaft to transmit 20 kw at 200 r.p.m. the ultimate shear stress for the steel may be taken as 360 MPa and F.O.S as 8. If hollow shaft is to be used in the place of solid shaft, find the inside and outside diameter. Consider inside to outside diameter ratio as 0.5.	**07**
Q.5	**(a)**	What is meant by: Dynamic loads, static loads?	**03**
	(b)	Briefly explain the hoop in context of thin cylinder.	**04**
	(c)	A compression spring is required to exert a minimum force of 250 N and maximum force 600 N. The deflection under these load condition is 15 mm. The spring must fit in a hole of 30 diameter. Design the static spring for static condition of load.	**07**

OR

Q.5	**(a)**	What are end fixity coefficients?	**03**
	(b)	Briefly explain the longitudinal stresses in context of thin cylinder.	**04**
	(c)	A right angle bell crank lever is shown in Fig-2. The load w = 4.5KN. The lever consists of forged steel material and a pin at the fulcrum. Take the following permissible stress for the pin and lever material. Safe stress in tension = 75MPa, safe stress in shear = 60MPa, safe bearing pressure on pin 10 N/mm^2 . The length of fulcrum pin is 1.25 times the diameter of fulcrum pin. Calculate the following: (1.) Reaction at fulcrum pin (2) Fulcrum pin dimensions (3). Lever dimensions.	**07**

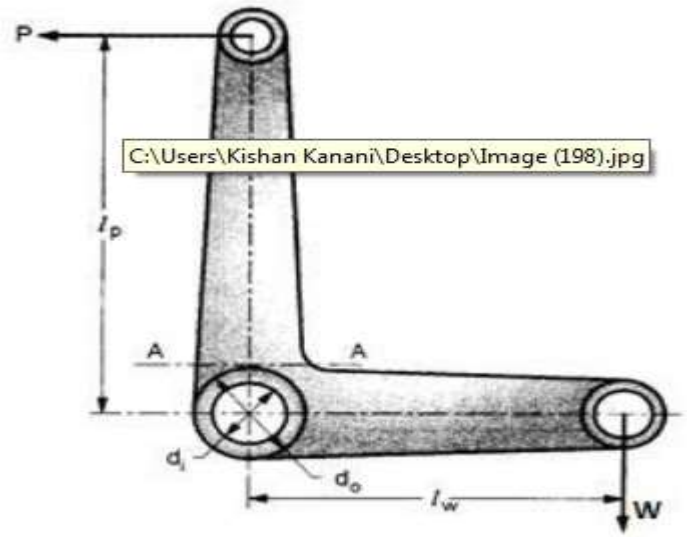

Fig 2.

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