Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2021

Subject Code:2152508 Date:17/09/2021

Subject Name:Design of Machine Elements

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Enlist types of fatigue stresses and explain it.	**03**
	(b)	What is stress concentration and how to avoid it.	**04**
	(c)	A bar of circular cross-section is subjected to alternating tensile forces varying from a minimum of 200 kN to a maximum of 500 kN. It is to be manufactured of a material with an ultimate tensile strength of 900 MPa and an endurance limit of 700 MPa. Determine the diameter of bar using safety factors of 3.5 related to ultimate tensile strength and 4 related to endurance limit and a stress concentration factor of 1.65 for fatigue load. Use Goodman straight line as basis for design.	**07**
Q.2	**(a)**	Enlist types of gears and explain in short.	**03**
	(b)	Explain involute and cycloid profile of gear.	**04**
	(c)	Explain design procedure of worm gear pair.	**07**
		OR	
	(c)	A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength.	**07**
Q.3	**(a)**	Explain gear material based on its application.	**03**
	(b)	Derive the relation $\Delta E = mR2\omega\ 2CS$ for energy stored in flywheel.	**04**
	(c)	Explain design procedure of cast iron pulley.	**07**
		OR	
Q.3	**(a)**	What is brake and enlist types of brakes.	**03**
	(b)	Explain types of belt drive. Discuss factors to be considered for selection of belt drive.	**04**
	(c)	A leather belt 9 mm × 250 mm is used to drive a cast iron pulley 900 mm in diameter at 336 r.p.m. If the active arc on the smaller pulley is 120° and the stress in tight side is 2 MPa, find the power capacity of the belt. The density of leather may be taken as 980 kg/m3, and the coefficient of friction of leather on cast iron is 0.35.	**07**
Q.4	**(a)**	Define clutch. Give classification of clutch.	**03**
	(b)	In brake design explain self-energizing and self-locking condition	**04**
	(c)	A single block brake is shown in Fig.1. The diameter of the drum is 250 mm and the angle of contact is 90°. If the operating force of 700 N is	**07**

applied at the end of a lever and the coefficient of friction between the drum and the lining is 0.35, determine the torque that may be transmitted by the block brake

OR

Q.4	**(a)**	Explain stresses in helical compression spring.	**03**
	(b)	Explain thick and thin cylinder in pressure vessel.	**04**
	(c)	Explain design procedure of semi elliptical leaf spring.	**07**
Q.5	**(a)**	Write down definition of spring index, spring rate, and solid length.	**03**
	(b)	Explain spring material based on application.	**04**
	(c)	Derive an equation of effort required for lifting the weight for square thread.	**07**

OR

Q.5	**(a)**	Explain self locking and over hauling screw.	**03**
	(b)	Explain efficiency of self locking screw.	**04**
	(c)	Explain deign procedure of screw jack.	**07**

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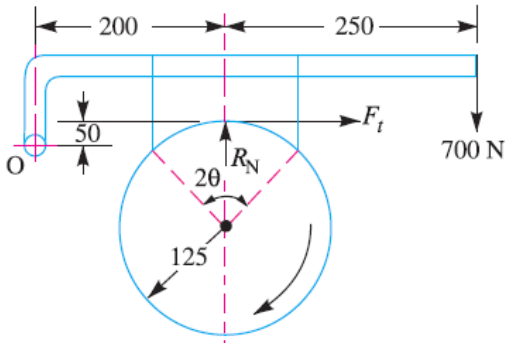

Figure: 1