Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2020

Subject Code: 2152508 **Date: 03/02/2021**

Subject Name: Design of Machine Elements

Time: 10:30 AM TO 12:30 PM **Total Marks: 56**

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of PSG design data book permitted.**

			MARKS
Q.1	**(a)**	Explain completely reversed or cyclic stresses.	**03**
	(b)	Discuss Gerber method for combination of stresses.	**04**
	(c)	Determine the thickness of a 120 mm wide uniform plate for safe continuous operation if the plate is to be subjected to a tensile load that has a maximum value of 250 kN and a minimum value of 100 kN. The properties of the plate material are as follows: Endurance limit stress = 225 MPa, and Yield point stress = 300 MPa. The factor of safety based on yield point may be taken as 1.5.	**07**
Q.2	**(a)**	Give characteristics of material for friction surfaces.	**03**
	(b)	Explain positive clutch and friction clutch.	**04**
	(c)	Discuss design procedure of simple band brake.	**07**
Q.3	**(a)**	Draw stress distribution diagram of thick cylinder subjected to an internal pressure.	**03**
	(b)	Give classification of pressure vessels.	**04**
	(c)	A cast iron cylinder of internal diameter 200 mm and thickness 50 mm is subjected to a pressure of 5 N/mm^2. Calculate the tangential and radial stresses at the inner, middle (radius = 125 mm) and outer surfaces.	**07**
Q.4	**(a)**	Give classification of bevel gear.	**03**
	(b)	Explain any four terms of worm gear.	**04**
	(c)	Discuss step by step design procedure of C- clamp.	**07**
Q.5	**(a)**	Explain coefficient of fluctuation of speed.	**03**
	(b)	Prove that fluctuation of energy in flywheel $\Delta E = m R^2 \omega^2 C_s$.	**04**
	(c)	The intercepted areas between the output torque curve and the mean resistance line of a turning moment diagram for a multicylinder engine, taken in order from one end are as follows: – 35, + 410, – 285, + 325, – 335, + 260, – 365, + 285, – 260 mm^2. The diagram has been drawn to a scale of 1 mm = 70 N-m and 1 mm = 4.5°. The engine speed is 900 r.p.m. and the fluctuation in speed is not to exceed 2% of the mean speed. Find the mass and cross-section of the flywheel rim having 650 mm mean diameter. The density of the material of the flywheel may be taken as 7200 kg / m3. The rim is rectangular with the width 2 times the thickness.	**07**
Q.6	**(a)**	Explain terms used in helical gears.	**03**
	(b)	Give advantages and disadvantages of gear drive.	**04**
	(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	**07**

bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth in volutes 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.

Q.7	**(a)**	Explain conical and volute springs.	**03**
	(b)	Discuss surge in springs.	**04**
	(c)	A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm^2, find the axial load which the spring can carry and the deflection per active turn.	**07**
Q.8	**(a)**	Derive equations for maximum efficiency of a square threaded screw.	**03**
	(b)	Explain types of screw threads used for power screws.	**04**
	(c)	Discuss complete design procedure of Screw jack.	**07**

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