Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2182503 Date:19/01/2021

Subject Name:Design of Product and Machine Tools

Time:02:00 PM TO 04:00 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)**	Give functions of machine tool structures and their requirements.	**03**
	(b)	Write advantages of geometrical progression.	**04**
	(c)	Prove that the loss of economic cutting speed is constant over the whole range of spindle speed in GP series.	**07**
Q.2	**(a)**	Discuss causes of failure of rolling contact bearings.	**03**
	(b)	Discuss functions and requirements of spindle unit.	**04**
	(c)	Design a gear box for milling machine having maximum and minimum speeds are 720 and 18 rpm respectively. Number of spindle speed are 12 and drive is from an electrical motor having 3.5 KW at 1400 rpm. Draw structural diagram and speed chart.	**07**
Q.3	**(a)**	Explain working of face plate variators with sketch.	**03**
	(b)	With suitable figure explain operating principle of hydrodynamic journal bearing.	**04**
	(c)	List types of feed boxes and explain any one with neat sketch.	**07**
Q.4	**(a)**	Give classification of steel wire ropes.	**03**
	(b)	Write a note on machine tool chatter.	**04**
	(c)	Write a note on Antifriction guide ways.	**07**
Q.5	**(a)**	Discuss requirements of machine tool structure.	**03**
	(b)	Explain step less regulation of speed and feed rates.	**04**
	(c)	A full journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4 N/mm^2. The speed of the journal is 900 r.p.m. and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m-s. The room temperature is 35°C. Find: **1**. The amount of artificial cooling required and **2**. The mass of the lubricating oil required, if the difference between the outlet and inlet temperature of the oil is 10°C. Take specific heat of the oil as 1850 J / kg / °C.	**07**
Q.6	**(a)**	What is product? Give structure of product design.	**03**
	(b)	Enlist and explain various factors to be considered for prepare a product design specifications.	**04**
	(c)	A ball bearing is subjected to a radial load of 10 KN and a thrust load of 4 KN. The inner ring rotates at 1000 rpm. The average life is to be	**07**

5000 hrs. What basic load rating must be used to select a bearing for this purpose?

Q.7 **(a)** Draw various design of machine tool spindle end showing standard taper angle. **03**

(b) Define bearing. Give classification of bearings. **04**

(c) Design a steel wire rope for a mine hoist for lifting 1500 kg in a single run. The hoist trolley weight 200 kg. the rope has two falls. The maximum acceleration imparted to the hoist while lifting is 3 m/sec^2. Select 6 x 19 rope having ultimate breaking strength of 1400 N/ mm^2 and Er = 9.8 x 10^4 N/mm^2. Considered total no of bends = 6. **07**

Q.8 **(a)** Explain factors to be considered for selection of material handling equipment. **03**

(b) Explain types of radial ball bearings. **04**

(c) Design a crane hook for lifting capacity of 7.5 tonnes. It is made of forged steel and has approximate triangular section. Take permissible tensile stress 125 N/mm^2 for forged steel. **07**

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