

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII (NEW) EXAMINATION – SUMMER 2022****Subject Code:2182503****Date:31/05/2022****Subject Name:Design of Product and Machine Tools****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.
5. Use of PSG design data book permitted.

		MARKS
Q.1	(a) Give advantages of geometrical progression.	03
	(b) Give general recommendation for developing the gearing diagram.	04
	(c) Discuss general requirements of machine tool design.	07
Q.2	(a) Explain with suitable figure working of faceplate variators and cone variators with swiveling friction disc.	03
	(b) What are the various laws for stepped regulation of speed in a multiple speed gear box?	04
	(c) A nine speed gear box is connected to a motor running at 720 rpm through a belt drive. The gear box is to have a minimum speed of 31.5 rpm and a maximum speed of 500 rpm. Using standard spindle speed: a) draw the structure and speed diagram for best possible arrangement and (b) draw the gear box layout for the best possible arrangement.	07
OR		
	(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 need for speed regulation.	03
	(b) Give properties of sliding contact bearing material.	04
	(c) Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 rpm for rating life of 5 years at 10 hours per day. Assume 300 working days per year and bearing subjected uniform and steady load.	07
OR		
Q.3	(a) Give functions and types of guide ways.	03
	(b) Why rolling contact bearing is known as antifriction bearing? Give advantages of rolling contact bearings over sliding contact bearings.	04
	(c) List types of feed boxes and explain any one with neat sketch.	07
Q.4	(a) Evaluate- feed box with gear cone with sliding key is not suitable for heavy duty lathe feed mechanism.	03
	(b) Discuss various methods to improve dynamic stiffness of machine tool.	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 $1850 \text{ J / kg / }^\circ\text{C}$. **07**
- OR**
- Q.4** (a) What is spindle? Explain functions of spindle unit. **03**
 (b) Explain factors to be considered for selection of material handling equipment. **04**
 (c) Design a crane hook for lifting capacity of 6 tonnes. It is made of forged steel and has approximate triangular section. Take permissible tensile stress 120 N/mm^2 for forged steel. **07**
- Q.5** (a) With suitable figure show various profiles of slide ways. **03**
 (b) Define bearing. Give classification of bearings. **04**
 (c) Discuss the role of aesthetics in product design. **07**
- OR**
- Q.5** (a) Explain factors to be considered for selection of material handling equipment. **03**
 (b) Explain various stages of product development process. **04**
 (c) Discuss a specific case study on product design. **07**
