Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-VIII Examination May 2012

Subject code: 182503

Subject Name: Design of Product and Machine Tools

Date: 14/05/2012 **Time: 10.30 am – 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. **Use of PSG Design Data book is permitted**

Q.1	**(a)**	Design the feed box of a lathe machine for the feed range 0.1 – 1.11 mm/rev. Given Ø = 1.41 and u = 2. Assume a suitable kinematic train between the spindle, and the input shaft of the feed box, and between the output shaft of the feed box and the rack, attached to the underside of the lathe bed.	**14**
Q.2	**(a)**	Explain with neat sketch the Cone and spheroidal variators with intermediate member.	**07**
	(b)	Prove that the loss of economic cutting speed is constant over the whole range of spindle speed in GP series.	**07**
		OR	
	(b)	What is Spindle? Explain functions and requirements of spindle unit. Also suggest the various materials used for spindle.	**07**
Q.3	**(a)**	Give comparison between Journal and Antifriction bearings.	**06**
	(b)	Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load 5000 N, operating at a speed of 1600 rpm for an average life of 5 years at 10 hours per day. Assume uniform and steady load.	**08**
		OR	
Q.3	**(a)**	Explain causes of failure of rolling contact bearings.	**04**
	(b)	Design a hydrodynamic bearing for a shaft of a centrifugal blower from following data:(i) blower speed = 600 rpm; (ii) shaft diameter = 50 mm; (iii) bearing load due to belt force = 3000 N; (iv) bearing load due to weight of rotor = 600 N; (v) expected temperature of oil = 70℃; (vi) ambient temperature =30℃; and (vii) C/d = 0.0015; (viii) minimum film thickness = 0.019 mm. Calculate the following parameter for journal bearing. a) Actual attitude b) Type of oil used c) Power loss due to friction d) Heat generated e) Actual minimum film thickness	**10**
Q.4	**(a)**	Prove $(l^2/h)_{opt}$ = 6 E [δ] / [σ] for design criteria of machine tool structure.	**07**

Also prove $V_{CI} / V_{MS} = 13.07$

	(b)	Enlist and explain any seven factors to be considered for preparing product design specification for mechanical lawn mower.	**07**

OR

Q.4	**(a)**	Give requirements of protecting devices for slide ways and explain various types of protecting devices with neat sketch.	**07**
	(b)	Explain various stages of product development process.	**07**
Q.5	**(a)**	Design a crane hook for lifting capacity of 7 tones. It is made from forge steel and has approximate triangular sections. Take permissible tensile stress 120 N/mm^2 for forged steel.	**10**
	(b)	Give the various criteria for selection of material handling equipment.	**04**

OR

Q.5	**(a)**	As a duty of design engineer in Devi Forge, you have to establish an overhead travelling crane with a lifting magnet. Select the ropes, pulleys and the drum required by considering following data. Lifting capacity = 5000 Kg (mass); weight of lifting magnet = 2000 Kg; weight of lifting tackle = 120 Kg; no of rope parts = 4. Consider 3 bands for individual parts of rope.	**10**
	(b)	Classify the material handling equipments.	**04**

****