Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VIII (NEW) EXAMINATION – WINTER 2021

Subject Code:2182503 Date:23/11/2021

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 Design Data book is permitted.**

Q.1	**(a)**	What is the difference between "Product Design" and "Machine Tool Design"?	**03**
	(b)	Explain how "Productivity" and "Accuracy" requirements are met in the design of machine tools.	**04**
	(c)	What are the causes and harmful effects of vibration in machine tools? How would you eliminate vibrations in a machine tool?	**07**
Q.2	**(a)**	Which material is generally used for design of machine tool bed? Why?	**03**
	(b)	Draw cross sectional sketches of "Flat Guide ways" and "Inverted V shaped Guide ways" Also discuss their features.	**04**
	(c)	Derive an equation for (l^2/h) optimum ratio for steel and cast iron beam. Conclude stiffness or strength criterion by comparing volumes of both materials.	**07**
		OR	
	(c)	With the help of neat sketch describe methods of adjusting clearances in slide ways.	**07**
Q.3	**(a)**	Compare and Contrast stepped regulation versus step less regulation.	**03**
	(b)	Draw a ray diagram for a gearbox of machine tool having 9 spindle speeds ranging from 90 to 1800 rpm, considering the gearbox should be compact one.	**04**
	(c)	For the above example also draw structural diagram. Considering motor rpm 1400 show the layout of gear box and find out number of teeth on various gears.	**07**
		OR	
Q.3	**(a)**	Define life of a ball bearing. What is equivalent load?	**03**
	(b)	How to avoid metal to metal condition (MMC) in hydrodynamic bearing? Explain with suitable diagram.	**04**
	(c)	Design a hydrodynamic bearing for a shaft of centrifugal blower from the following data: Blower speed : 600 rpm, Shaft Diameter : 50 mm Bearing load due to belt force : 3000 N Bearing load due to weight of rotor : 600 N Expected temperature of oil : 70°C Ambient temperature : 30°C C/d ratio : 0.0015, Minimum film thickness : 0.019 Calculate: (i) Actual altitude (ii) Type of oil used (iii) Power loss (iv) Heat generated (v) Actual minimum film thickness.	**07**

Q.4	**(a)**	Will you prefer a cast hook or forged hook in cranes? Give reasons for your answer.	**03**
	(b)	Give merits of using a pulley tackle in lifting and hoisting machine.	**04**
	(c)	The 6 x 19 wire rope is used to lift the cage of vertical mine hoist 400 m deep. The weight of the cage is 1200 kg (mass) and it has to lift 3000 kg of ore at a speed of 15m/s which has to be attained in 10 seconds. Take D min/d = 75. Assume factor of safety 5 and $E=8 \times 10^4$ N/mm^2. Weight of the rope/metre = $0.0034d^2$ kg. Cross sectional area of rope = $0.38d^2$. Ultimate stress for wire rope is 1800 N/mm^2. Determine diameter of rope.	**07**
		OR	
Q.4	**(a)**	Why economic evaluation of designed product is needed before launching of any product in market?	**03**
	(b)	What is product development? How prototype can help to improve a product?	**04**
	(c)	Consider a product as keyboard of desktop and present a case using ergonomic and functional aspect of product design.	**07**
Q.5	**(a)**	Which information is essentially required before starting a designing of stepped drive?	**03**
	(b)	What are the major advantages of geometric progression series used in machine tool drives?	**04**
	(c)	Elaborate functions performed by spindle unit and requirements of it.	**07**
		OR	
Q.5	**(a)**	Draw and brief any ONE device for intermittent motion in Machine Tool.	**03**
	(b)	What are the causes of Machine Tool Chatter?	**04**
	(c)	Draw commonly used column sections used in machine tools and brief about their applications	**07**

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