GUJARAT TECHNOLOGICAL UNIVERSITY ME - SEMESTER- II (Old course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 1720903

Subject Name: Machine Tool Design

Time: 02:30 pm to 5:00 pm

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Explain the procedure for selection of motor in machine tool that works under 07 (a) constant loading condition & (b) variable loading condition.
 - (b) What are the major design requirements for a guide-ways? Derive the equation 07 for forces acting on the mating surfaces in a combination of V and Flat slide-ways. (Orthogonal cutting condition).
- Q.2 (a) Define the unit strength under torsion and derive the following equation for a 07 bar subjected to the torsion. $W_1/W_2 = (\frac{2/3}{\mu_2} \mu_2) / (\frac{2/3}{\mu_1} \mu_1)$
 - (b) State the basic design procedure for machine tool structure and bring out the 07 role of cutting force, friction force, forces of reactions, forces due to mass of structure and inertial forces due to vibration.

OR

- (b) Derive the following relationship between the actual parameter and its value 07 determined on the model, helpful in model technique in design of machine tool structure:
 - (a) Relation for natural frequency of torsional vibration

Discuss the limitation of Perspex model for the analysis.

- Q.3 (a) õThe life and smooth functioning of slide-ways depends significantly upon the 07 clearance between the sliding surfacesö. Justify the statement.
 - (b) Critically compare the sliding friction sleeve bearing and roller friction 07 ball/roller/needle bearing used for the spindle.

OR

- Q.3 (a) Derive and plot the pressure distribution diagram along slide-way length for the 07 following condition:
 - 1) $X_A/L > 1/6$
 - 2) $X_A/L = 0$ where $X_A = L/6(P_{max} P_{min}/P_{max} + P_{min})$ X_A =distance between point of action of normal force on slide-way and center of carriage and L=length of carriage
 - (b) On the basis of power transmission capabilities, the axis of shaft transmitting 07 motion, state the basic conditions under which spur, helical, bevel and worm gears are selected in the mechanical drives.
- Q.4 (a) State the function of pressure valve and throttle valve in the hydraulic system 07 and compare the ball type and spool type pressure valve.
 - (b) State and explain the functions and requirements of spindle units and justify 07 the same.

Total Marks: 70

Date:14/05/2015

- Q.4 (a) State the different shapes of slide-ways used in machine tools and discuss the 07 application of each of them with due justification.
 - (b) Derive the equation for total deflection of spindle axis due to compliance of 07 spindle supports.
- Q.5 (a) State the functions, requirements and classification of the control systems for . changing speeds and feeds in a machine tool.
 - (b) Discuss the ergonomic considerations applied to the design of lever, knob and 07 push button in detail.

OR

- Q.5 (a) What are the recent developments in the design of machine tool element? 07 Explain any two of them.
 - (b) Find the forces on flat guide ways on a lathe, if guide ways are 25 mm thick and 50 mm wide. The center distance between the guide ways is 400 mm. The machine has a 110 mm height above the guide ways top faces. The machine is powered by a 6 kw motor. The machine mostly shapes steel work pieces at a speed of 26 m/min. The tool frictional force is 30 % of the cutting force. Weight of saddle is 40 kg and length of saddle is 250 mm. =60 and =30
