Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Remedial Examination December 2010

Subject code: 720903 **Subject Name: Machine Tool Design**
Date: 21 /12 /2010 **Time: 02.30 pm – 05.00 pm**
Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** "The power rating of the motor is determined from considerations of permissible overloading and heating, and the higher of the two values is taken for selecting the motor."-Justify. **06**

(b) "In machine tools variable delivery vane pump and radial piston pumps are preferable." – Comment on the degree of validity of the statement. **06**

Q.2 **(a)** A drum cam in the feed gear box permits the use of single lever control in changing the feed. With the help of sketch explain the mechanism of working of a drum cam in the feed gear box. **06**

(b) "Elementary transmissions for transmitting rotary motion are decided on the basis of intersecting axes, amount of power to be transmitted and speed reduction ratio." – Evaluate the statement with suitable examples from real engineering situations. **06**

OR

(b) State the function of pressure valve and throttle valve in the hydraulic system and compare ball type and spool type pressure valve. **06**

Q.3 **(a)** State and explain the functions and requirements of spindle unit and justify the same for the case of the lathe as a machine tool. **06**

(b) The spindle ends of most of the machine tools have a tapered hole for accommodating the centre. Explain the ways to improve the centering accuracy of the spindle and the stiffness of a tapered joint. **06**

OR

Q.3 **(a)** Plot the variation of y_x / y_{Amax} as a function of x/l for varying values of α and draw the suitable conclusions on the live and dead centers. In the usual notations y_x and y_{Amax} are minimum and maximum displacement at a tailstock centre and y_{Amax} is the maximum deflection at the headstock centre. **06**

(b) Plot the variation of y_{max} - y_{min} / y_{Amax} versus α and draw suitable conclusions on the profile accuracy. In the usual notations y_{max}, y_{min} are the maximum, minimum displacement at tailstock centre and y_{Amax} is the maximum displacement at headstock centre. **06**

Q.4 **(a)** "A bed subjected to torsional loading is constructed as a closed box type structure, while bed subjected to bending is constructed as I section." Give the mathematical proof to support the statement. **06**

(b) Plot the variation of volume (calculated on the basis of design that considers strength and deflection as independent criterion) and the ratio of l^2/h for two different materials namely cast iron and steel for a simply supported structure with a point load at the centre. **06**

OR

Q.4 **(a)** A vertical milling machine is to be designed for HSS as well as cemented carbide face milling cutters. The carbide cutters have diameters between 50 to 250 mm and number of teeth between 8 to14. The corresponding ranges for HSS cutter diameter are 80 to 250 mm and 10 to 26 teeth respectively. The minimum cutting speed is 30 m/min (HSS-Mild Steel pair) and the maximum speed is 500 m/min (carbide-aluminum pair). Determine the frequency range that must be avoided while designing the elements of machine. **06**

(b) Plot the variation of dynamic amplification factor as a function of η (the ratio of excited frequency to natural frequency of excitation) for varying values of damping factor ρ. Draw suitable conclusions to avoid resonance and give the guide lines for designing the structure on static and dynamic conditions **06**

Q.5 **(a)** The table below shows the slide way profile and combination for three applications for beds. **06**

No	Slideway Profile & Combination	Application
1	Open V + Open V	Planing Machine
2	Open flat + Open V	Surface Grinding Machine
3	Closed flat + Closed V	Heavy duty boring machine

Justify the slideway profile and combination for the said application.

(b) Discuss the methods of adjusting clearances in slideways and bring out special features, limitations and applications of each of them. **06**

OR

Q.5 **(a)** State the functions, requirements and classification of the control systems for changing speeds and feeds in a machine tool. **06**

(b) Mention the important source of random variations of the cutting conditions and suggest the ways to control it through suitable control system. **06**

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