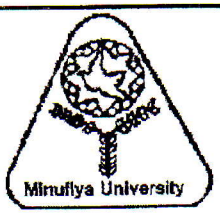
Menoufiya University Faculty of Engineering Shebin El- Kom Second Semester Examination Academic Year: 2013-2014 Date: 7/6/2014		Dept.: Production Engineering Year : Fourth Subject: Machine Dynamics Code : PRE 421 Time Allowed: 3 hours Total Marks : 90 Marks
Allowed Tables and Charts: None.		

Answer All The Following Questions:

Question No.(1): **[22 Mark]**

(a)- [4]- Explain briefly the various methods for vibration control in machine tool structure.

(b)- [3]- Three boring machines generate noise level of 40 db and 50 db for the first and second machines and of unknown noise level for the third machine. Determine the noise level of the third machine if the noise level of the three machines together is given by 55 db.

(c)- [15]- The milling machine of mass m= 400 kg , as shown in Fig.(1), is mounted on the isolator modeled as spring-damper set (K = 10^6 N/m and C = 8000 N.s/m). A driving motor is attached to the machine vibrates due to the out of balance of its rotor which is equivalent to a force : F_m = 1200 sin 90t N.

1- Determine the mathematical modeling of the milling machine and its amplitude (X_m),

2- Design the proper isolator (K_t, C_t) to be connected to the machine tool of mass m_t = 1 kg such that the amplitude of chatter within U_{max} = 0.84 mm, take the frequency ratio (Z_t) = 1.5

3- Specify the proper damped dynamic absorber (m_a , k_a , c_a) such that the permissible chatter is U_{per} = 0.7 mm.

Question No.(2): **[23 Mark]**

(a)- [5]- Define the modal analysis and compare with the aid of neat sketches between the two types of excitation of a prototype of a machine to obtain the *FRF*.

(b)- [18]- A mathematical model of a horizontal milling machine of knee type is shown in Fig.(2) where : $4m_1 = m_2 = 40$ kg, $3k_1 = k_2 = 6x10^3$ N/m, $3c_1 = c_2 = 720$ N.s/m .

1- Compute the natural frequencies and natural modes of the systems,

2- Construct and draw the frequency response function *(FRF)* for each modal,

3- Due to the corrective maintenance, some modifications in mass and stiffness elements are: $\Delta m_1 = 3$ kg, $\Delta m_2 = 5$ kg, $\Delta k_1 = 20$ N/m, $\Delta k_2 = 40$ N/m.
Compute the modified natural frequencies and natural modes of the systems.

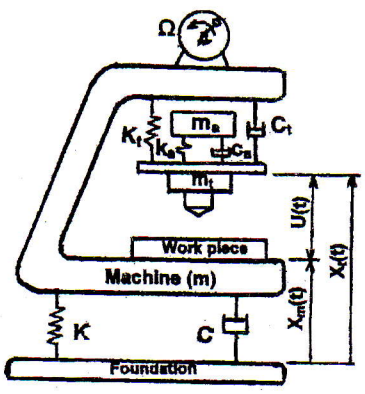


Fig.(1)

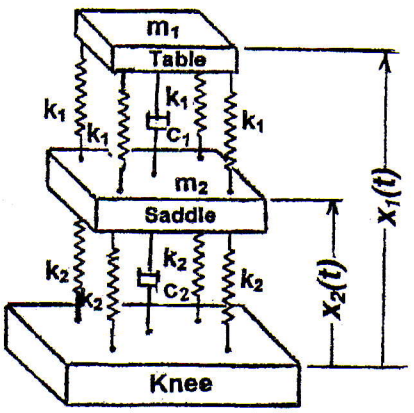


Fig.(2)

Question No.(3): [22 Mark]

. a) [7.5] Write a short notes about the following:
Receptance - Strain gauge - Force pick-up - Electro dynamic exciter - Threshold condition.

b) [7.5] Determine the dynamic cutting force coefficients (k_1, k_2, k_3).

c) [7] How can a production engineer estimate the chatter frequency?

Question No.(4): [23 Mark]

a) [8] Draw the force polygon for representation of the dynamic cutting force components at the limit of stability due to an excitation force by using polar coordinates.

b) [8] From the above drawing prove that:

$$\tan \Phi = \frac{C\theta + \mu \sin \theta}{1 - \mu \cos \theta}$$

d) [7] What are the benefits of general stability charts of machine tools? How it can be constructed?

WITH MY BEST WISHES

Prof. Dr / Taha Ali El-Taweel

Dr. / Mohamed Hesham Belal

This exam measure the following ILOs												
Question No.	Q1-a	Q2-a	Q2-b	Q3-a	Q1-c	Q2-b	Q3-b	Q4-b	Q1-b	Q2-a	Q3-b	Q4-b
	a-19	a-1	a-15	a-1	b-10	b-13	b-10	b-13	c-5	c-17	c-5	c-17
Skills	**Knowledge & Understand**				**Intellectual**				**Professional**			