



**UNIVERSITI KUALA LUMPUR
Malaysia France Institute**

**FINAL EXAMINATION
JULY 2010 SESSION**

SUBJECT CODE : FCB 20101
SUBJECT TITLE : VIBRATION ✓
LEVEL : BACHELOR
TIME / DURATION : 12.30pm – 2.30pm
(2 HOURS)
DATE : 10 NOVEMBER 2010

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper **CAREFULLY**.
 2. This question paper is printed on both sides of the paper.
 3. Please write your answers on the answer booklet provided.
 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 5. Answer all questions.
 6. Answer all questions in English.
 7. Formulae are appended.
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THERE ARE 2 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

Refer to Figure Q1(a) and Q1(b).

A tray of mass m_1 is supported by 3 springs as shown in Figure 1(a). The natural frequency f_n is 2Hz. An additional mass $m_2 = 1\text{kg}$ is placed at the center on top of the mass, the natural frequency is observed to be 0.8Hz. Calculate the mass m_1 .

(10 marks)

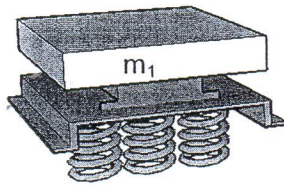


Figure Q1(a): Original system

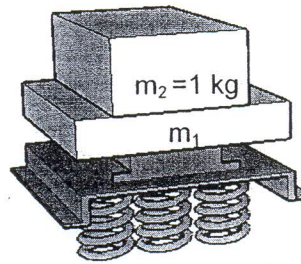


Figure Q1(b): system with m_2 added

Question 2

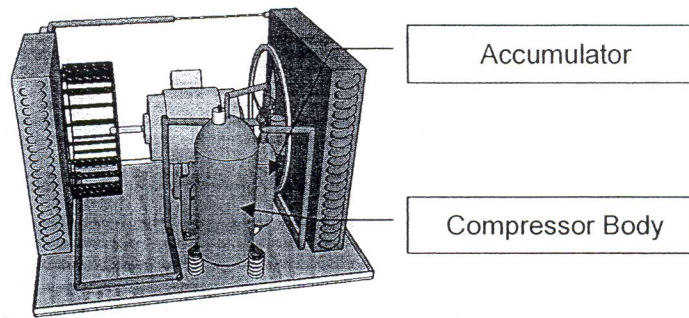


Figure 2(a): Window unit

Refer figure Q2(a), Q2(b) and Appendix 1 and 2. The above shown a window unit. The details fitting dimensions as shown in figure 3(b). The system need to be attenuate (vibration isolation efficiency) by 90%.

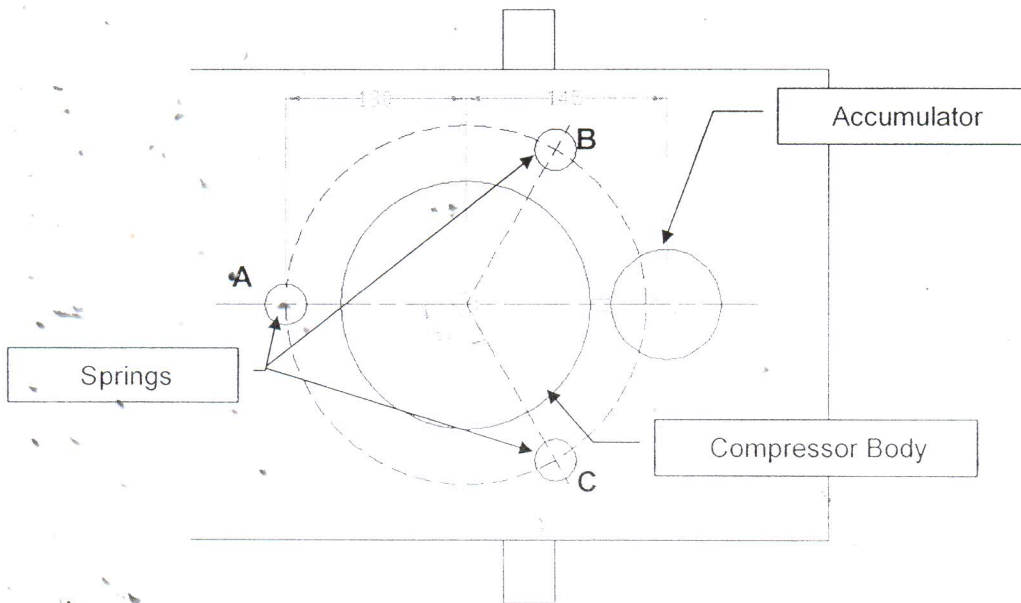


Figure 3(b): Details Dimensions of window unit

System specification:

Power supply	=	240V-1 ϕ -50Hz
Compressor body	=	8 kg
N	=	1600 rpm
weight of Accumulator	=	0.7 kg

(Note: Let 20% as Safety Factor (S.F) for the final weight calculation)

For all the spring mountings at corner A,B and C

- (a) Calculate spring static deflection δ_{st} in (mm) and spring stiffness k in (N/m) (20 marks)
- (b) Refer to Appendix 2, select the closest suitable spring (10 marks)

END OF QUESTION

APPENDICES

VIBRATION ISOLATOR SELECTION PROCEDURE

1. DETERMINE THE SUGGESTED ISOLATION EFFICIENCY.

REFER TABLE AV 01

2. DETERMINE THE STATIC DEFLECTION CAUSED BY THE VIBRATION .

REFER TABLE AV 02

3. SELECT THE TYPE OF VIBRATION ISOLATOR

REFER TABLE AV 02 OR CATALOGUE

4. CHECK THE ISOLATION SELECTION

REFER TABLE AV 03

5. DETERMINE THE MINIMUM DEFLECTION REQUIRED.

REFER TABLE AV 04

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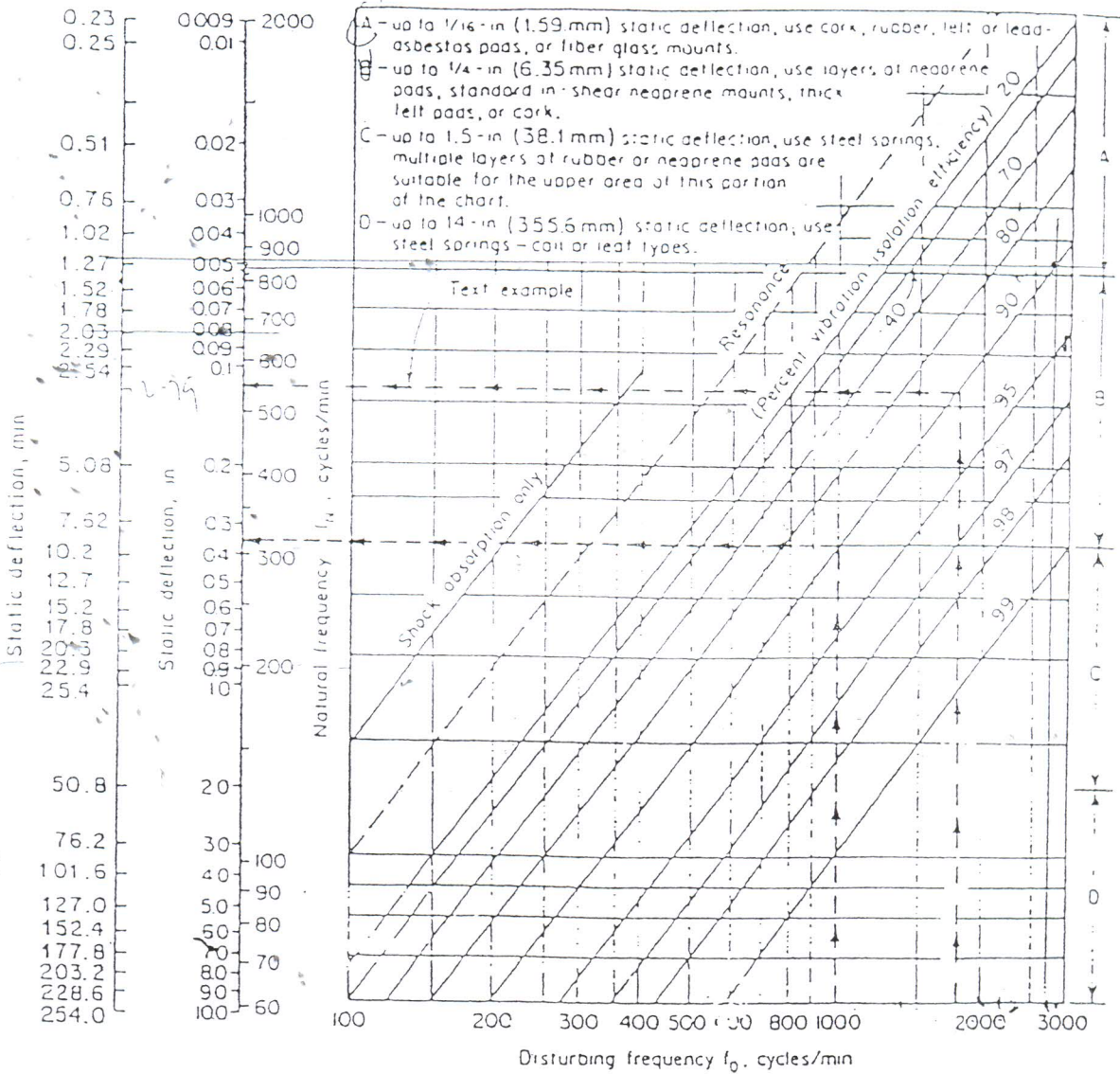
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GENERAL SUMMARY

TABLE AV 02
 DEFLECTION FOR VARIOUS DISTURBING FREQUENCIES





GENERAL SUMMARY

TABLE AV 04
MINIMUM MOUNTING DEFLECTIONS

Operating speed, r/min	Basement—negligible floor deflection, in (mm)	Rigid concrete floor, in (mm)	Upper story—light-concrete floor, in (mm)	Wood floor, in (mm)
300	1.50 (38.1)	3.00 (76.2)	3.50 (88.9)	4.00 (101.6)
500	0.63 (16.0)	1.25 (31.8)	1.65 (41.9)	1.95 (49.5)
800	0.25 (6.35)	0.60 (15.2)	1.00 (25.4)	1.25 (31.6)
1200	0.20 (5.08)	0.45 (11.4)	0.80 (20.3)	1.00 (25.4)
1800	0.10 (2.54)	0.35 (8.9)	0.80 (20.3)	1.00 (25.4)
3600	0.03 (0.76)	0.20 (5.08)	0.80 (20.3)	1.00 (25.4)
7200	0.03 (0.76)	0.20 (5.08)	0.80 (20.3)	1.00 (25.4)

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Vibration Isolation

Table 2: For Concrete Floor Slab In Less Critical Application

Recommended Isolation Efficiencies (150mm (6inch) Concrete Floor Slab)

<i>Less Critical Areas</i>	<i>Transmissibility %</i>	<i>Isolation Efficiency %</i>
Centrifugal compressors	6	94
Centrifugal fans greater than 25HP	10	90
Reciprocating compressors greater than 50HP		
Pumps greater than 5HP		
Unit air conditioners supported		
Fan coil units supported		
Axial flow fans greater than 50HP	20	80
Centrifugal fans 5 to 25HP		
Reciprocating compressors 10 to 50HP		
Pumps 3 to 5HP		
Air handling units		
Unit air conditioners hung		
Fan coil units hung		
Axial flow fans 10 to 50HP	25	75
Axial flow fans up to 10HP	30	70
Centrifugal fans up to 10HP		
Reciprocating compressors up to 10HP		
Pumps up to 3HP		
Pipes hung		
Gas fired boilers (more than 100 000BThU, 25kW)	12 to 20Hz	
Oil fired boilers (more than 60 000BThU, 15kW)	12 to 20Hz	

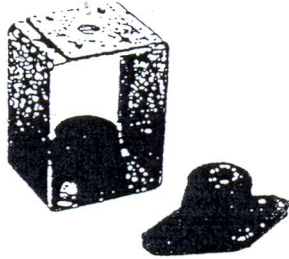
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VIBRATION ISOLATORS
RUBBER-IN-SHEAR



FEATURES

These mounts provide effective isolation of noise and vibration from equipment speeds of 15 r/s (6-pole) upwards.

Types R and RD only

- threaded insert in the top for equipment fastening.
- rated static deflection from 5-12mm.
- non-skid ribbed base; bolting down not normally required.
- moulded in oil-resistant materials, colour-coded for easy identification of the load range.
- corrosion-proof element; metal parts embedded in the elastomer.

Types RH and RHD only

- rated static deflection from 5-12mm.
- moulded in oil-resistant materials
- colour-coded for easy identification of the load range.
- corrosion-proof element; metal parts embedded in the elastomer
- heavy-duty steel cage.
- if mechanical or fire damage occurs, the metal plates in the hanger element interlock so that complete loss of support is unlikely.
- fully weatherproofed.

If features or ratings are required beyond that shown, please contact Fantech.

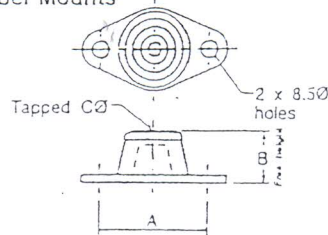
HOW TO ORDER

When selecting vibration isolators, divide the weight of the unit being isolated by the number of mounts being used to determine the kg/mount required. Then select the mount with the next highest weight loading and deflection required. Vibration isolators are generally used in sets of four.

VIBRATION ISOLATORS

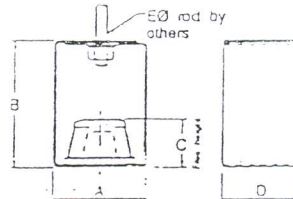
DIMENSIONS & SELECTION TABLES

Rubber Mounts



Model No.	Colour	Max. Load, kg/mt	Static Defl. mm	Dimensions, mm		
				A	B	CØ
Single deflection						
R-1	Blue	15	5	60	28	M8
	Black	25	5			
	Red	40	5			
R-2	Blue	60	6	76	32	M10
	Black	75	6			
Double deflection						
RD-1	Blue	15	10	60	35	M8
	Black	25	10			
	Red	40	10			
RD-2	Blue	60	12	76	44	M10
	Black	75	12			

Hanger Mounts



Model No.	Colour	Max. Load, kg	Static Defl. mm	Dimensions, mm				
				A	B	C	D	EØ
Single deflection								
RH-1	Blue	15	5	60	75	31	50	10
	Black	25	5					
	Red	40	5					
RH-2	Black	75	6	75	130	41	55	16
Double deflection								
RHD-1	Blue	15	10	60	75	38	50	10
	Black	25	10					
	Red	40	10					
RHD-2	Black	75	12	75	130	54	65	16