Answer all the following Questions

Question (1)   **(20 Marks)**

   a) Explain shortly the theory of eddy current testing method? List the advantages and limitations as a NDT method?

   b) Write briefly about the recent trends and the specific applications of the eddy current testing technique.

   c) What is the magnetic particles theory and how it can be used in detecting surface defects?

Question (2)   **(30 Marks)**

   a) Define the permeability property in magnetism– write some applications?

   b) Explain briefly the liquid penetrant method, advantages, disadvantages developers and applications.

   c) Discuss the health and safety precautions when applying penetrant testing.

   d) Make a complete comparison between radiography, ultrasonic and infrared techniques as a NDT methods.

Question (3)   **(6+9+6+9 Marks)**

   a) Explain the basic characteristics used to measure and describe vibration. What is the best parameter for all vibration measurements? Why?

   b) Explain how to detect faults in ball and rolling bearings.

   c) "Unbalance due to unequal weight distribution is the most common cause of vibration in machines". Explain why balancing of machines is necessary, indicating with the aid of neat sketches some reasons for unbalancing.

   d) A fan with five blades with the following positions ($0°.72°, 144°, 216°, 288°$).

   The following measurements were made during balancing job:

   Original reading: $v_0 = 15$ mm/sec, $\Phi_0 = 180°$

   First trial reading: $v_1 = 20$ mm/sec, $\Phi_1 = 270°$

   Known that: trial mass = 4 gm, and diameter of fan = 200 mm.

Draw the vector diagram; calculate the correction mass and the position where it should be mounted.

Question (4)   **(7+5+8 Marks)**

a) With the help of neat sketches, explain two sensors which are used for measuring vibrations

b) Demonstrate the sources of vibration from gears.

c) A gearbox has a high level of vibration. There are two shafts connected with two gears with 20 and 35 teeth respectively. The first shaft runs at 3600 rpm. A frequency spectrum at the running speed 3600 rpm shows a peak at 60 Hz, a larger peak at 35 Hz, and peaks at 1165 , 1200, and 1235 Hz . Comment on the cause of vibration.

This exam contributes "by measuring ILOs" in achieving Programme Academic Standards according to NARS											
Question Number	Q1-b,c	Q2-a,d	Q3-c	Q4-a	Q1-a	Q2-b	Q4-a	Q4-b	Q2-d	Q3-b	Q3-d	Q4-c
	a13-1	a13-1, a20-1	a13-1	a13-1, a20-1	b6-1	b2-1	b2-1	b6-1	C5-1	c5-1, c16-1	c5-1, c16-1	c5-1, c16-1
Skills	Knowledge & Understanding Skills				Intellectual Skills				Professional Skills			