Answer all the following Questions

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

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

b) Explain a NDT method for checking the performance of the refrigerators.

c) Make a complete comparison between radiography and ultrasonic techniques as a NDT methods.

Question (3)   **(25 Marks)**

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

b) Explain briefly how the vibration measurements and analysis can be used for condition monitoring and fault diagnosis of machinery.

c) Explain the use of vibration measurements to determine the overall bearing condition for rotating machinery with the aid of neat sketches.

Question (4)   **(25 Marks)**

a) With the help of neat sketches, Draw the piezoelectric accelerometer and velocity transducer indicating the theory of operation, also, the advantages and disadvantages of both.

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.

GOOD LUCK