Thapar Institute of Engineering and Technology, Patiala

End Semester Examination, December, 2006

Characterization and Testing of Materials (MS-102)

Time : 3 hour **Marks : 36**

- **Attempt five questions in all. Question No. 1 is compulsory.**
- **Make neat and clean diagrams.**
- **Attempt all parts of a question together.**

Q1 Is the following Statements are true or false. No marks without explanation in 50-100 words.

(a) Higher the frequency of ultrasonic, higher is the sensitivity of UFD.

(b) Color metallograph can provide more information about the surface characteristics.

(c) Surface defects like seams can be located by Penetrant method.

(d) Visual Testing can give the information about the internal composition of the materials

(4x2)

Q2

(a) What is Differential Interference Contrast (DIC) Optical Microscopy? Discuss its important feature.

(b) How the resolution of an optical microscope varies with wavelength of light used?

(c) Discuss the various factors that are required to be considered for selection of material for aerospace applications.

(3, 2, 2)

Q3

(a) Show that cross-sectional information of particle can be calculated from the total scattered flux of light.

(b) Gas adsorption method can be used to calculate pore size of the compacted powders. How?

(c) Discuss the two applications of Differential Thermal Analysis technique.

(3, 2, 2)

Q4

(a) What are the effect of fatigue on the properties of the materials? Describe the fatigue limit and its criticality in aeroplane parts.

(b) What is Torsion testing? How it can be performed on axel or main shaft of an automobile.

(c) How the Impact Strength of a material varies with the temperature?

(3, 2, 2)

Q5

(a) How one can use Ultrasonic Flaw Detector to find size and position of crack in a metallic specimen?

(b) Longitudinal waves are setup in a quartz plate. The fundamental frequency of vibration is given by $N = (2.87X10^5 / t)$, where N is in Hz and t is the thickness of the plate in cm. Compute the (a) Young's modulus of the quartz plate, (b) the thickness of the plate required for a frequency of 1.2 MHz. The density of quartz is 2.66 gm/cm^3.

(c) How Tempilstiks can be used for thermal testing of the materials?

(3, 2, 2)

Q6

(a) How Thermogravimetric Analysis is carried out for polymeric materials?

(b) The particle size distribution of a powder is as follows:

Mean Size(μm)	4	6	9	12	18	25
Number of particles:	10	16	20	25	15	7

Calculate the arithmetic, geometric and harmonic mean sizes. Also draw histogram for the above distribution.

(c) What are the limitations of the Radiograph?

(3, 3, 1)