Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 40533

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Seventh Semester

Aeronautical Engineering

AE 6702 – EXPERIMENTAL STRESS ANALYSIS

(Regulations 2013)

Time : Three Hours   Maximum : 100 Marks

PART – A   (10×2=20 Marks)

1. Classify strain measuring instruments based on their principle of operation.

2. How are the range and sensitivity of a measuring instrument related ?

3. Define the gauge factor of an electrical resistance strain gauge.

4. Briefly write about semi-conductor sensing material for strain gauge application.

5. What is a waveplate ?

6. Explain the term photoelastic dispersion.

7. Give possible reasons for error during experiments in photoelasticity.

8. Give an application of the brittle coating technique.

9. List the significant disadvantages of radiography.

10. State the scope and application of ultrasonics in the engineering field.

PART – B   (5×16=80 Marks)

11. a) i) In the early stages of electrical resistance strain gauges, how were the gauges constructed ?   (3)

   ii) What is the error involved while using finite length strain gauges ? Should gauge length be minimized ?   (4)

   iii) Explain the physical principles of the laser displacement sensor.   (9)

(OR)

   b) i) List the characteristics requirements of a strain gauge system.   (7)

   ii) Neatly sketch a Huggenberger extensometer and label its parts. Obtain the magnification factor of this instrument.   (9)

40533

12. a) i) List the characteristic advantages of Karma alloy as the sensing material in an electrical resistance strain gauge. (3)

ii) What is the importance of the elongation limit of an electrical resistance strain gauge ? (4)

iii) Explain zero shift, linearity and hysteresis under electrical resistance strain gauge performance characteristics. (9)

(OR)

b) i) How is the performance of an electrical resistance strain gauge affected by temperature ? (4)

ii) Explain how the Wheatstone circuit can be used with electrical resistance strain gauges for strain measurement in bars and beams. (12)

13. a) i) Sketch and list the features of a potentiometer circuit suitable for dynamic strain measurement. (4)

ii) Consider a shaft subject to torque. Explain how the experimental evaluation of shear strain due to torque using a half-bridge Wheatstone circuit and electrical resistance strain gauges can be carried out. (12)

(OR)

b) Explain the effect of a stressed model placed in a plane polariscope set-up. Differentiate between isoclinics and isochromatics.

14. a) i) Why are compensation, separation and fringe multiplication procedures required in photoelasticity ? (7)

ii) Give reasons for the necessity of specimen calibration before the conduct photoelastic experimental procedures. Describe a calibration procedure. (9)

(OR)

b) i) Briefly introduce the concept behind Moire methods of strain analysis. (7)

ii) Give examples of brittle coating crack patterns. What are the failure theories which are applicable for brittle coatings ? (9)

15. a) Describe the ULTRASONICS method of non-destructive testing. What are the advantages and limitations of this method ?

(OR)

b) Explain the application of radiography as a non-destructive testing procedure for aircraft structural parts. What are the advantageous and good points of this method ?

———————