Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **M.TECH**

MDPE209

2nd Semester Back Examination 2016-17
EXPERIMENTAL STRESS ANALYSIS
BRANCH(S): DESIGN AND DYNAMICS, MACHINE DESIGN, MECH. SYSTEM DESIGN
Time: 3 Hours
Max Marks: 70
Q.CODE: Z1075
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** (2 x 10)

a) State the effect of photo elastic
b) What do you mean by Wave plate?
c) What will be relative angular retardation Δ in a quarter-wave plate designed for operation at λ=546.1nm if it is employed with sodium light where λ=589.3 nm.
d) State the functions of backing materials.
e) What is weldable gauge? State its advantages.
f) What are the birefrigerant coating and reflection polariscope?
g) Name the two geometric moiré techniques to predict the out of plane displacement W.
h) Define strain sensitivity with reference to brittle coating method. How it can be measured?
i) Name any two simple compensation techniques to determine fractional fringe order at a point in a stressed model.
j) A fringe order of 2.5 was observed at a point in a stressed model with light having λ=589nm. What fringe order is observed at the point in consideration when light with λ=548nm is used.

Q2 a) What are the important properties of an ideal photo elastic material? Discuss the important photo elastic material. (5)

b) What is the importance of Fractional fringe order? Show how "Tardy's" method of compensation is used to measure fractional fringe order & derive suitable expression for fractional fringe order. (5)

Q3 The following readings of strain were obtained on a three-element rectangular strain rosette mounted on a Aluminium for which E=70GPa, v =0.3, ε_A= +285 μ strains, ε_B= +65 μ strains, ε_C= 102 μ strains .Determine:
i)The Principal stresses and its direction
ii) The Principal strains and its direction
iii) The maximum shear (10)

Q4 . What is photo elastic polariscope? State the different types of polariscope. Describe how you would make a circular polariscope, identify all its components and derive an expression for the intensity of the light wave in a dark field arrangement. (10)

Q5 a) What are the effects of temperature changes on the performance of a strain gauge? How would you compensate the system for temperature changes? (5)

b) Explain the important applications of photo elasticity. A circular disc of diameter D = 40mm and thickness t = 5mm compressed diametrically is used as a calibration specimen in photoelastic test. The fringe orders at the disc centre and corresponding loads are:

Load P	25	48	73	124
fringe order (N)	1	2	3	5

Find the model and material fringe values. The principal stresses at the disc centre are given by, $\sigma 1 = 2P/\pi Dt$ & $\sigma 2 = -6P/\pi Dt$. (5)

Q6 a) Explain multiple gauge circuits w.r.t the Wheatstone bridge for measurement of strain (5)

b) What do you mean by electrical resistance strain gauge? Derive an expression for the gauge factor of an electric resistance strain gauge. (5)

Q7 a) What are the types of brittle coatings? State the advantages of brittle coatings. Calculate the principal stresses in the coating if the principal stresses in the steel specimen are found to be 33.34Mpa and -13.34Mpa.Assume for coating EC=1.866Gpa μc=0.42 and for steel Es=200Gpa and μs=0.29. (10)

Q8 **Write down the short notes on any two of the followings.** (5 x 2)

a) Strain gauge materials
b) Strain rosette
c) Isoclinic and isochromatics
D) Law of failure of brittle coating