Total Number of Pages: 02   **M.TECH**
                                                                                                                          MDPE209

2nd Sem Regular / Back Examination – 2015-16
EXPERIMENTAL STRESS ANALYSIS
Q.CODE: W796
Time: 3 Hours
Max marks: 70

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)   Define polarizer and polarized light.
   b)   Define Birefringence. Give example
   c)   Define wave plate. What are the different types of wave plates?
   d)   Calculate the thickness of a stressed model so that the polarized light passing through
        it breaks into two components having phase difference of π/2. Given the wave length
        of light λ =548 nm and refractive indices 1.31 and 1.29 respectively.
   e)   In an experiment witha tensile specimen using circular polariscope, following load
        versus fringe order values are obtained. If width of specimen is 13 mm, find the
        material fringe value.

Load (P) in N	Fringe Order (m)
100	1
200	2
300	3
400	4

   f)   Write down the advantages and disadvantages of brittle coating method.
   g)   What are the ideal requirements of a strain gauge?
   h)   What are semiconductor gauges?
   i)   What are different bonding materials used in strain gauge application?
   j)   Derive the expression for gauge factor for resistance gauges.

Q2 a) Explain about shear difference technique for determination of separate principal   (5)
        stresses.
    b) A 6 mm thick model produces a fringe order of 4 at a point where the isoclinic   (5)
        parameter is 30^0 . Determine the shearing stress and normal stress difference at that
        point. Given material fringe value 14 N/mm.

Q3   Derive the expression of light intensity for plane polariscope. Write down the   (10)
        conditions of isoclinics and isochromatics.

Q4   How Wheatstone's bridge circuits are used for obtaining strain output?   (10)

Q5 a) A thin walled steel cylinder is subjected to an internal pressure of 2.1 Mpa. The (5)
cylinder is 1 m in diameter and 30 mm thick. Two gauges of identical type with cross
sensitivity factor 0.03 are mounted along axial and circumferential directions
respectively. Find the strain readings shown by these gauges. Given E=200 GPa and
Poisson's ratio 0.3.

b) A rectangular rosette is mounted at a point on surface of a steel plate. With respect to (5)
the x-axis following strains were obtained: ε_{A-}= -500µε, ε_B = 400 µε,ε_C = -100 µε.
Calculate the principal stresses in the system. Given E $_{steel}$ = 200GPa, Poisson's ratio
=0.3.

Q6 a) What are the different types of brittle coatings? Write down the various stages in brittle (5)
coating method.

b) Calculate the two principal stresses in the coating if the principal stresses in the steel (5)
specimen are found to be 33.34 MPa and -13.34 MPa. Assume for coating: E= 1.866
GPa, Poisson's ratio = 0.42 and for steel: E=200 GPa, Poisson's ratio = 0.29.

Q7 Explain in details how stress freezing technique is employed in 3D photo elasticity. (10)

Q8 Write a note on any two: (5 x 2)
a) Stress Optic Law
b) Oblique incidence method
c) State of stress in brittle coating
d) Cross-Sensitivity