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

Total Number of Pages: 02 **M.TECH**
P2MDCC10

2nd Semester Regular Examination 2016-17
EXPERIMENTAL STRESS ANALYSIS
BRANCH: DESIGN AND DYNAMICS, MACHINE DESIGN, MECH. SYSTEM DESIGN, MECH. SYSTEMS DESIGN & DYNAMICS, SYSTEM DESIGN

Time: 3 Hours
Max Marks: 100
Q.CODE:Z813

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) Explain the various factors affecting the performance of foil strain gauges.
b) What is wave plate? State its types
c) State the functions of backing materials. Name any two.
d) Explain two methods of achieving temperature compensation in measurement of strain
e) Explain the working principle of an electric resistance strain gauge.
f) What will be relative angular retardation in a quarter-wave plate designed for operation at l=546.1nm if it is employed with sodium light where l=589.3 nm?
g) Difference between stress coat and all temp as materials used for strain indication by brittle coating method
h) What do you mean by static calibration of strain gauge?
i) What is fringe multiplication in geometric Moire method?
j) Explain the polarization of light and classify it.

Q2 a) Explain separation technique in photoelastic method and name the various methods. With a neat sketch explain any two separation method in details. (10)

b) Describe how you would make a Plane polariscope, identify all its components and derive an expression for the intensity of the light wave in a field arrangement. (10)

Q3 a) What do you mean by calibration method. What are the various methods of calibration of a photoelastic model material. Explain a method of calibration of photo elastic model material using circular disk under diametrial compression. (10)

b) Define and explain in brief wheat stone bridge sensitivity? What are the essential requirements of a balancing technique. Discuss the different ways in which bridge can balance (10)

Q4 a) Define a Strain rosette and mention the different types of strain rosette configurations. Explain the construction of the three elements Delta rosette and derive the expressions for the principal stresses and their orientations in terms of strain measurement readings. (10)

b) Three strain gauges are applied to an area; at a point in such a manner that gauge "B" makes a +ve 300 with the gauge "A" and gauge "C" makes an angle of 450 with gauge "B". The strains obtained are as follows. e_A= -600 μm/m, e_B= -400 μm/m, e_C= 400 μm/m. Take E= 2X 105 N/mm2& Poisson's ratio μ= 0.3. Calculate principal stresses, strains and their directions. (10)

Q5 a) Explain the birefringent coating method and derive the expression for stresses and strains in the specimen in terms of fringe order, material fringe value & coating thickness (10)

b) Explain the principle of brittle coating technique and enumerate the advantages and disadvantages. Describe the different Brittle coating materials & enumerate the properties of a good Brittle coating material. (10)

Q6 a) What are the requirement of aresistance strain gauge? Derive the expressions of gauge factor or axial sensitivity for an electrical resistance strain gauge (10)

b) Explain the different types of terms with a neat sketch: (a)Isostatics (b)Isoentatics (c)Isoclinics (d)Isochromatics (e) Isotenics (10)

Q7 a) Define polarization and explain the working principle of a polariscope. Derive stress optic law used in Photoelasticity with respect to the term σ, m,d,f_σ and state the significance of each term involved. (10)

b) What do you mean by three dimensional photoelasticity? Explain in detail with a neat sketch about the Frozen stress method in 3-D. (10)