Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2017**

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| **Code :** | **14ME3039** | **Duration :** | **3hrs** |
| **Sub. Name :** | **EXPERIMENTAL STRESS ANALYSIS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | | **Course**  **Outcome** | **Marks** |
| 1. | a. | What is the condition for a material under plane stress? | | CO1 | 2 |
| b. | For the state of stress shown in figure  30MPa  70MPa  40MPa  (i) construct Mohr’s circle,  (ii) determine the principal stresses,  (iii) determine the maximum shearing stress  and the corresponding normal stress. | | CO1 | 18 |
| (OR) | | | | | |
| 2. |  | A cylindrical storage tank used to transport gas under pressure has an inner diameter of 500 mm and a wall thickness of 15 mm. Strain gages attached to the surface of the tank in transverse and longitudinal directions indicate strains of 240x10-6 and 60x10-6 mm/mm respectively. Knowing that a torsion test has shown that the modulus of rigidity of the material used in the tank is 80 GPa, determine (a) the gage pressure inside the tank, (b) the principal stresses and the maximum shearing stress in the wall of the tank.  500 mm dia.  1  2 | CO1 | | 20 |
|  |  |  |  | |  |
| 3. | a. | What are the primary advantages of constantan material used in strain gages? | CO2 | | 4 |
|  | b. | Using a 60° rosette, the following strains have been determined at point Q on the surface of a steel machine base: ε1=60 μ , ε2=900 μ and ε3=300 μ using the coordinates axes shown, determine at point Q  (i) the strain components εx , εy and γxy  (ii) the principal strains  60°  60°  1  2  3  Q  x  y  (iii) the maximum shearing strain    Use Poisson ratio ν = 0.3 | CO2 | | 16 |
|  |  | (OR) |  | |  |
| 4. | a. | Derive the sensitivity of strain gage in terms of Poisson’s ratio, resistivity and strain. | CO2 | | 8 |
|  | b. | Discuss any four fundamental measurment characteristics which influence the output of strain gage. | CO2 | | 12 |
|  |  |  |  | |  |
| 5. | a. | Derive phase shift relation of light wave in a medium of depth d; Δ=(nr-1)d where Δ = phase shift | CO2 | | 4 |
|  | b. | Explain circularly polarized light in detail with suitable sketches. | CO2 | | 16 |
| (OR) | | | | | |
| 6. | a. | Derive the basic photo-elastic equation | | CO2 | 4 |
|  | b. | Explain isoclinic fringe analysis of disk loaded in compression | | CO2 | 16 |
| 7. | a. | Explain brittle-coating crack patterns to the state of stress with suitable sketches. | | CO3 | 10 |
|  | b. | Derive the relation between the state of stress in coating and that in the model of brittle-coating method. | | CO3 | 10 |
| (OR) | | | | | |
| 8. | a. | Explain Moire fringe formation phenomena in detail. | | CO3 | 5 |
|  | b. | Explain geometrical approach in Moire fringe analysis. | | CO3 | 15 |
|  | |  | |  |  |
|  | | **Compulsory**: | |  |  |
| 9. |  | Explain digital image processing used in digital photo elasticity. | | CO3 | 20 |

ALL THE BEST