

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (AERONAUTICAL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: AIRCRAFT STRUCTURES [AAE 2101]

REVISED CREDIT SYSTEM (22/12/2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitable assumed.
- **1A.** How would you find the bending stress in unsymmetrical section? (02)
- **1B.** Derive an expression for bending stress at a layer in a beam. (04)
- 1C. A steel plate of width 120mm and of thickness 20mm is bent into a circular (04) arc of radius 10m. Determine the maximum stress induced and the bending moment which will produce the maximum stress. Take E= 200GPa.
- 2A. What do you mean by strength of a shaft? (02)
- **2B.** Derive an expression for the shear stress produced in a circular shaft which is **(04)** subject to torsion. What are the assumptions made in the derivation?
- 2C. A hollow shaft of external diameter 120mm transmits 300kW power at 200 (04) rpm. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60 N/mm².
- **3A.** Define the term obliquity and how it is measured. (02)
- **3B.** Draw Mohr's circle of stresses and explain how will you obtain the principal **(04)** stresses and principal planes.
- **3C.** What are the sign conventions for shear force and bending moment in **(04)** general? Draw the shear force and bending moment diagrams for a cantilever of length L carrying a uniformly distributed load of w/m length over its entire length.

- **4A.** Explain how the failure of a short and long column takes place? (02)
- **4B.** Deduce an expression for the Euler's crippling load of an ideal column pin **(04)** jointed at each end.
- **4C.** Obtain the expressions for the slope and deflection of a simply supported **(04)** beam with point load at the centre.
- 5A. How the shear centre is determined for symmetrical sections? (02)
- 5B. The cross section of an airplane elevator is shown in figure.1. If the elevator (04) is 2m long and constructed from aluminium alloy with G=30GPa, Calculate the total angle of twist of the section and the magnitude of shear stress for an applied torque of 40Nm.
- **5C.** Determine the position of shear Centre for a channel section of 400mm by **(04)** 200mm outside and 5mm thick.



Figure.1.