Roll No……..….. **Total No. of Printed Pages: 2**
Total No. of Questions: [09]

B. Tech Aeronautical Engg. (Semester – 3rd)
STRENGTH OF MATERIALS
Subject Code: BANES1304
Paper ID: [18110214]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. Draw Mohr's circle for two-dimension stress condition x = 10 MPa, y = –10 MPa and xy = 0.
b. Define Poisson's ratio.
c. Define Torsion equation.
d. Classify springs?
e. Write the equation for deflection of a simply supported beam carrying a point load at the centre?
f. What are composite beams?
g. Why is deflection of beams needed for engineering applications?
h. Enlist various modes of failure observed in columns.
i. Which types of stresses are developed in leaf springs, helical spring and flat spiral springs?
j. Enlist various assumptions made in theory of torsion.

Section – B **(5 marks each)**

Q2. Drive the Bending Equation?

Q3. Design a closed coiled helical spring which will deflect 60 mm under a load of 700 N. The radius of the coil is 6 times the wire diameter; the maximum shear stress is not to exceed 8 MPa. G= 80 GPa.

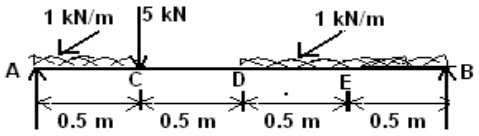
Q4. Draw a typical stress strain curve for mild steel under tension, on the curve locate the salient points.

Q5. A solid circular shaft of 150 mm diameter and 5 m length is fixed rigidly at both ends. At a distance of 2 m from left end, a torque of 30kN-m is applied. Find the angle of twist of the rod at the point of application of the torque and the maximum shear stress developed in the shaft assuming modulus of rigidity of the shaft material as 8×104 N/mm^2 .

Q6. Calculate the Euler's buckling load for a column with one end fixed and other end free and made of a tube that is 4 m long, internal diameter of 3 cm and 4 mm wall thickness. E = 75 GPa.

Section – C **(10 marks each)**

Q7. Draw the S.F. and B.M. diagram for simply supported beam loaded as shown in fig.



Q8. At a point in a material, there are normal stresses of shear stress 30 MPa and 60 MPa both tensile together with a shearing stress of 25 MPa. Find the values of principal stresses and inclination of principal planes. Also, find the orientation of planes of maximum shear stress.

Q9. A cantilever beam of length 'L' and flexural rigidity "EI" is loaded with a uniformly distributed load of intensity "w". Find the expression for slope, and deflection at the free end.