

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-IV Examination June- 2010

Subject code:140101

Subject Name: Aircraft Structure - 1

Date: 18 / 06 / 2010

Time: 10.30 am – 01.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Explain impact-factor. Deduce its expression in the form of 07

$$\text{Impact factor} = 1 + \sqrt{1 + \frac{2h}{\delta_{st}}} \quad \text{all notations are as usual.}$$

(b) Explain construction of Mohr's circle for stress. 07

Q.2 (a) Why I section is preferred over rectangular cross section for aircraft structures? 07

(b) State common characteristics of aircraft structures and list the common properties required for aircraft materials. 07

OR

(b) List the different aero materials available and explain about composites materials and sandwich materials. 07

Q.3 (a) Solve for the reactive elements of the propped beam shown in Fig. 1. 07

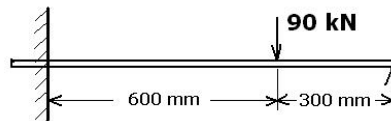


Fig. 1

(b) A simply supported beam shown in Fig. 2 carries a uniform load **W** N/unit length, symmetrically distributed over part of its length. Determine the maximum deflection δ and show that 07

$$\delta = \frac{5}{384} \frac{wl^4}{EI} \quad \text{when } a=0.$$

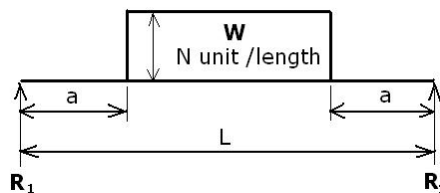


Fig. 2

OR

Q.3 (a) A simply supported beam with an concentrated load **P** anywhere on the span as shown in Fig. 3. Measuring x from **A**, show that the maximum deflection occurs at 07

$$x = \sqrt{\frac{a}{3L} [(a+b)^2 + ab + b^2]}$$

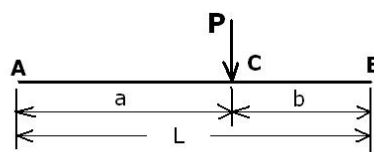


Fig. 3

(b) Starting from the First law derive equations of principle strain. 07

- Q.4 (a) A simply supported beam is subjected to the impact of a load falling freely through the height h before striking the mid-point of the beam and causing the dynamic deflection δ . Assuming h is larger compared to static deflection δ_{st} and 'c' is the distance of maximum distance fiber from neutral axis. Show that $\delta_{max} = \sqrt{\frac{6WhEc^2}{LI}}$ 10

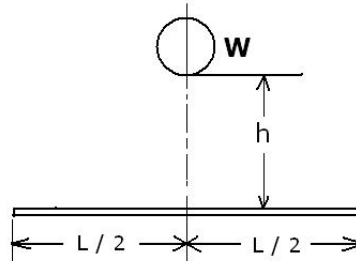


Fig. 4

(b) With help of neat sketch explain wing construction. 04

OR

- Q.4 (a) A crane hook has a rectangular cross-section 50mm X 100mm, with inner radius 75 mm. What is the maximum load P that will not exceed the stress of 100 N/mm^2 . 10

(b) Explain monocoque and semi-monocoque constructions. 04

Q.5 (a) Differentiate between short column and long column. 07

(b) Starting from first law, derive equations for normal principle stresses. 07

OR

Q.5 (a) Why Eulers formula is preferred for long column? 07

(b) Prove that maximum principle shear stress $\tau_{max} = (\sigma_1 - \sigma_2)/2$ 07
