**Seat No.: _____** **Enrolment No._____**

# GUJARAT TECHNOLOGICAL UNIVERSITY

## BE SEM-IV Examination-Nov/Dec-2011

**Subject code: 140101** **Date: 28/11/2011**

**Subject Name: Aircraft structure-I**

**Time: 02.30 pm -5.00 pm** **Total marks: 70**

**Instructions:**

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

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|---|---|---|---|
| **Q.1** | **(a)** | Explain the Principle of Super position with its statement. | **03** |
| | **(b)** | Find static indeterminacy of structures given in figure 1 (a, b, c, d) | **04** |
| | **(c)** | Find kinematic indeterminacy of structures given in figure 1 (a, b, c, d) | **04** |
| | **(d)** | A simply supported beam is subjected to a central point load. If the slope is $0.5^0$ at support due to the effect of loading, calculate deflection at center. length of the beam is 4 m. | **03** |
| **Q.2** | **(a)** | Write the different required characteristics of the Aircraft structure. Why hollow section and I-sections are preferred for aircraft structure? | **07** |
| | **(b)** | A crane hook has a rectangular cross-section 75 mm X 150mm, with inner radius 100 mm. What is the maximum load P that will not exceed the stress of 120 $N/mm^2$? | **07** |
| | | **OR** | |
| | **(b)** | A space-curved bar of circular in cross section is loaded as shown in figure 2. Calculate maximum and Minimum stresses at the critical section p-q. | **07** |
| **Q.3** | **(a)** | Define Conjugate beam method theorems and explain it with its all support conditions. | **07** |
| | **(b)** | A beam of span 4 m is simply supported at the ends and loaded as shown in fig. 3 Using Macaulay's method; determine the slope at end A and deflection under point C. Take EI = 2 x $10^3$ $kNm^2$. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Which points should be take care while using Macaulay's Method. | **02** |
| | **(b)** | Find Slope at support and Deflection at the centre for the simply supported beam subjected to point load at the centre. | **05** |
| | **(c)** | Calculate deflection at point B and C for the beam as shown in fig. 4 using conjugate beam method. Take EI = 2 x $10^3$ $kNm^2$. | **07** |
| **Q.4** | **(a)** | Define strain energy, proof resilience and modulus of resilience | **03** |
| | **(b)** | Derive the equation of the strain energy stored in a member due to Torsion. | **04** |
| | **(c)** | A simply supported beam AB of span 5m carries a uniformly distributed load of 20 kN/m over its entire span. Determine the strain energy stored in the beam. Take E = 2 x $10^5$ $N/mm^2$ and I = 2 x $10^8$ $mm^4$. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Define Crippling load, Slenderness ratio, Crushing load | **03** |

**(b)** Derive Euler's crippling load formula for the long column fixed at both ends. **04**

**(c)** A hollow C.I Column whose outside diameter is 300 mm has a thickness of 25 mm. It is 5 m long and is fixed at both ends. Calculate the critical loads by Euler's theory and also by Rankine's theory. For cast iron take $F_c = 500$ N/mm$^2$ and $\alpha = 1/1600$, E = 12 x $10^4$ N/mm$^2$. **07**

**Q.5** **(a)** Explain about plane-stress condition and derive expressions of equilibrium equations. **07**

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

**OR**

**Q.5** **(a)** What do you mean by plane-strain condition? Explain about principle stresses with help of Mohr's circle. **07**

**(b)** Derive the equation of a deflected curve. **07**

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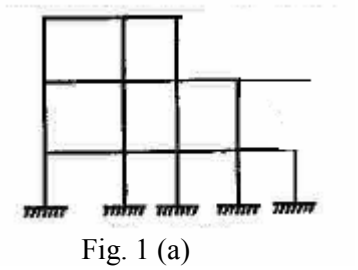


Fig. 1 (a)

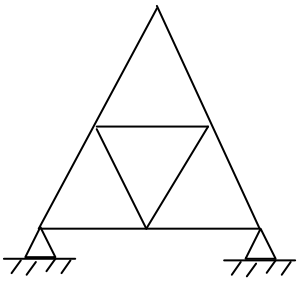


Fig. 1(b)

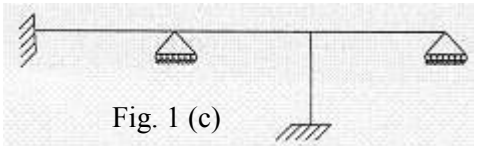
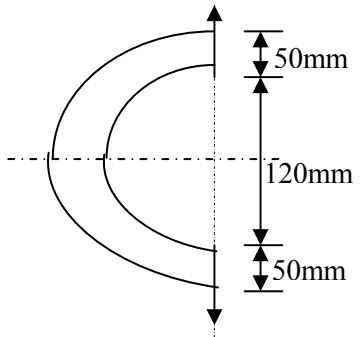


Fig. 1 (c)

Fig. 1(d)



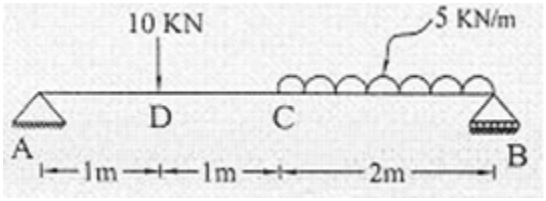




Fig. 3

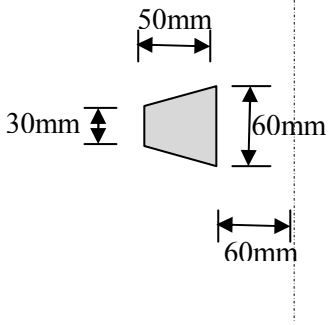



Fig. 2

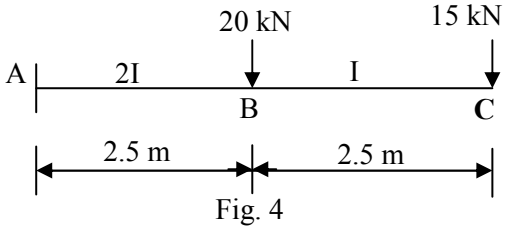



Fig. 4