B.Tech IV Year I Semester (R09) Supplementary Examinations June 2017

STRUCTURAL ANALYSIS & DETAILED DESIGN

(Aeronautical Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) How is an airplane built? Explain with the help of a block diagram.

(b) Explain structural stiffness, aerodynamic characteristics in structural design criteria.

2 (a) List out and explain the properties of engineering materials for use in the manufacture of an aircraft in detail.

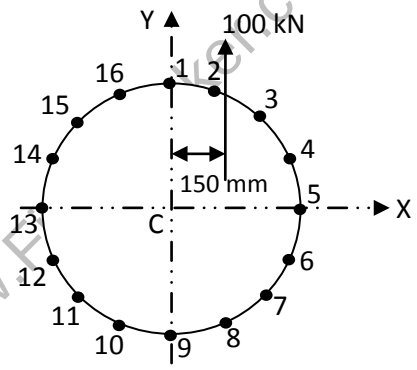
(b) Explain briefly about landing gear and loads acting and landing gear of aircraft.

3 (a) Explain the different loads acting on an aircraft.

(b) Draw and explain different types of wing leading and trailing edges used to increase the maximum lift at low speed flight and also explain the advantages and disadvantages of different drive systems used in aircraft wings.

4 Discuss the functioning of a fuselage, its loading and its general requirements.

The fuselage is subjected to a vertical shear load of 100 kN applied at a distance of 150 mm from the vertical axis of symmetry as shown, for the idealized section, in figure below. Calculate the distribution of shear flow in the section.



5 (a) Explain the process of wing design.

(b) The skin of the upper side of an airplane wing is made of 2024-T6 Al clad. The stringer spacing is 125 mm, and the rib spacing is 500 mm. Assuming the edges to be simply supported, find the compression buckling stress for skin gages of: (i) 0.5. (ii) 0.8. (iii) Land. (iv) 1.60 mm.

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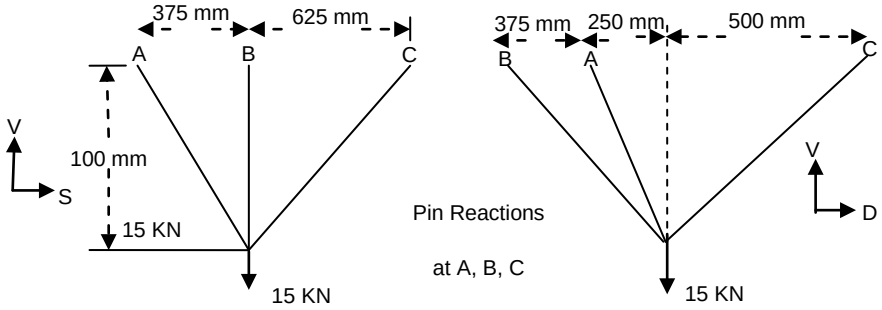
6 Determine the axial loads in the members of the landing gear structure shown in figure. The members are pinned to supports at A, B and C.



7 What is meant by reliability? Explain about bath tub curve.

8 (a) Define and explain the following theories of failures:
(i) Maximum shear stress.
(ii) Maximum strain energy theorem.
(iii) Maximum shear strain energy design.

(b) A thin cylindrical shell, 2.5 m in diameter is composed of plates 12.5 mm thick. The yield stress of for the material is 300 N/mm^2. Calculate the internal pressure which would cause yielding according to the following theories of failure.
(i) Maximum shear stress.
(ii) Maximum strain energy.
(iii) Maximum shear strain energy. Poisson's ratio = 0.25.

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