SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-641 035, TAMIL NADU

19AST203-AIRCRAFT STRUCTURAL MECHANICS

MULTIPLE CHOICE QUESTIONS

UNIT-I

1. Which material is commonly used for constructing aircraft wings due to its lightweight and high strength? a) Steel b) Aluminum c) Titanium d) Carbon fiber Answer: b) Aluminum

2. What is the primary purpose of a fuselage in an aircraft? a) To provide lift b) To house the cockpit and passengers c) To stabilize the aircraft d) To control the direction of flight Answer: b) To house the cockpit and passengers

3. Which type of stress occurs when two forces of equal magnitude act in opposite directions, trying to pull the material apart? a) Shear stress b) Torsional stress c) Compression stress d) Tensile stress Answer: d) Tensile stress

4. Which part of an aircraft is primarily responsible for supporting the weight of the aircraft during flight? a) Fuselage b) Wings c) Tail d) Landing gear Answer: b) Wings

5. What is the purpose of wing spars in an aircraft's wing structure? a) To provide aerodynamic stability b) To control the movement of flaps and ailerons c) To distribute the weight of the aircraft evenly d) To provide structural support and strength Answer: d) To provide structural support and strength

6. Which type of stress occurs when forces are applied parallel to the cross-sectional area of a material, causing it to deform by sliding layers past each other? a) Shear stress b) Torsional stress c) Compression stress d) Tensile stress Answer: a) Shear stress

7. What is the purpose of aircraft skin panels? a) To provide a smooth surface for aerodynamic efficiency b) To house the engines c) To control the aircraft's altitude d) To provide insulation for the cabin Answer: a) To provide a smooth surface for aerodynamic efficiency

8. Which part of an aircraft's structure is designed to absorb and distribute landing impact forces? a) Fuselage b) Wings c) Landing gear d) Tail Answer: c) Landing gear

9. What is the function of a rib in an aircraft's wing structure? a) To provide structural support and shape to the wing b) To control the aircraft's altitude c) To house the engines d) To provide insulation for the cabin Answer: a) To provide structural support and shape to the wing

10. Which material is often used in modern aircraft construction due to its high strength-to-weight ratio and resistance to corrosion? a) Wood b) Steel c) Aluminum d) Composite materials Answer: d) Composite materials

UNIT-II

1. What is the defining characteristic of a statically determinate structure? a) It has fewer support reactions than the number of equations of equilibrium. b) It has the same number of support reactions as the number of equations of equilibrium. c) It has more support reactions than the number of equations of equilibrium. d) It doesn't have any support reactions. Answer: b) It has the same number of support reactions as the number of equations of equilibrium.

2. How many equations of equilibrium are typically used to analyze a statically determinate structure in two dimensions? a) 1 b) 2 c) 3 d) 4 Answer: b) 2

3. Which of the following is NOT a statically determinate structure? a) Simply supported beam with one point load b) Cantilever beam with two point loads c) Truss with three support reactions d) Continuous beam with four support reactions Answer: c) Truss with three support reactions

4. In a statically determinate structure, how are internal forces and reactions determined? a) By solving equilibrium equations only b) By solving compatibility equations only c) By solving both equilibrium and compatibility equations d) By using trial and error method Answer: a) By solving equilibrium equations only

5. Which method is commonly used to analyze statically determinate trusses? a) Method of sections b) Moment distribution method c) Slope deflection method d) Castigliano's theorem Answer: a) Method of sections

6. What is the degree of static indeterminacy of a structure with 3 support reactions and 2 equations of equilibrium? a) 0 b) 1 c) 2 d) 3 Answer: b) 1

7. What is the primary advantage of statically determinate structures in engineering analysis? a) They are easier to analyze and design compared to indeterminate structures. b) They can withstand higher loads without failure. c) They offer more design flexibility. d) They require fewer materials for construction. Answer: a) They are easier to analyze and design compared to indeterminate structures.

8. Which theorem or principle is often applied to solve statically determinate beam and frame structures subjected to external loads? a) Castigliano's theorem b) The principle

of virtual work c) The principle of superposition d) The method of joints Answer: b) The principle of virtual work

9. What is the minimum number of support reactions required for a statically determinate beam with external loads? a) 0 b) 1 c) 2 d) 3 Answer: b) 1

10. Which condition must be satisfied for a structure to be statically determinate? a) Equilibrium equations are statically admissible. b) Compatibility equations are statically admissible. c) Both equilibrium and compatibility equations are statically admissible. d) External loads are statically admissible. Answer: c) Both equilibrium and compatibility equations are statically admissible.

UNIT-III

1. What is the primary function of a column in structural engineering? a) To resist axial compression loads b) To resist shear forces c) To provide stability against lateral loads d) To support bending moments Answer: a) To resist axial compression loads

2. Which of the following factors does NOT affect the buckling strength of a column? a) Column length b) Column cross-sectional area c) Column material d) Column temperature Answer: d) Column temperature

3. What type of failure occurs when a column is subjected to compressive loads exceeding its buckling strength? a) Tensile failure b) Shear failure c) Flexural failure d) Buckling failure Answer: d) Buckling failure

4. Which of the following column shapes typically offers the highest resistance to buckling? a) Circular b) Square c) Rectangular d) Hollow Answer: a) Circular

5. What is the slenderness ratio of a column? a) The ratio of its length to its cross-sectional area b) The ratio of its length to its radius of gyration c) The ratio of its cross-sectional area to its length d) The ratio of its radius of gyration to its length Answer: b) The ratio of its length to its radius of gyration

6. What does the Euler buckling formula describe? a) The critical load at which a column will fail by buckling b) The maximum stress a column can withstand before buckling c) The deformation of a column under compressive loads d) The deflection of a column under bending moments Answer: a) The critical load at which a column will fail by buckling

7. In which direction does buckling typically occur in a column? a) Axially b) Laterally c) Torsionally d) Radially Answer: b) Laterally

8. What is the effect of increasing the slenderness ratio of a column? a) It increases the column's buckling strength. b) It decreases the column's buckling strength. c) It has no effect on the column's buckling strength. d) It increases the column's compressive strength. Answer: b) It decreases the column's buckling strength.

9. Which of the following methods is commonly used to increase the buckling strength of a column? a) Decreasing the column length b) Increasing the column cross-sectional area c) Decreasing the column material strength d) Increasing the column slenderness ratio Answer: b) Increasing the column cross-sectional area

10. What is the primary difference between a short column and a long column? a) Short columns buckle under axial loads, while long columns do not. b) Short columns experience flexural failure, while long columns experience buckling failure. c) Short columns have a slenderness ratio less than 20, while long columns have a slenderness ratio greater than 20. d) Short columns have a higher buckling strength than long columns. Answer: c) Short columns have a slenderness ratio less than 20, while long columns have a slenderness ratio greater than 20.

UNIT-IV

1. What is shear flow in structural engineering? a) The flow of fluid through a structure b) The distribution of shear stress along the cross-section of a member c) The deformation of a structure under shear loads d) The transfer of shear forces between structural members Answer: b) The distribution of shear stress along the cross-section of a member

2. In a beam with an open cross-section, where is the shear flow typically highest? a) At the centroid of the cross-section b) At the top flange c) At the bottom flange d) At the neutral axis Answer: b) At the top flange

3. Which equation represents the relationship between shear force VV, shear flow qq, and the moment of inertia II in a beam? a) $q=V/I$ b) $V=qI$ c) $q=V/q$ d) $V=q/V$ Answer: d) $V=q/V$

4. What is the SI unit of shear flow? a) Newton (N) b) Newton per meter (N/m) c) Newton-meter (Nm) d) Newton per meter squared (N/m^2) Answer: b) Newton per meter (N/m)

5. In a built-up beam composed of two materials, how is the total shear flow distributed between the materials? a) It is evenly distributed regardless of material properties. b) It is distributed based on the materials' elastic moduli. c) It is distributed based on the materials' shear moduli. d) It is distributed based on the materials' densities. Answer: b) It is distributed based on the materials' elastic moduli.

6. Which condition must be satisfied to ensure equilibrium of shear flow in a built-up beam? a) The total applied shear force must be zero. b) The sum of the shear flows in each material must be zero. c) The sum of the moments about any point must be zero. d) The shear flow must be constant throughout the beam. Answer: b) The sum of the shear flows in each material must be zero.

7. What happens to the shear flow in a beam when it encounters a concentrated load? a) It remains constant throughout the beam. b) It decreases as it approaches the point of the load. c) It increases as it approaches the point of the load. d) It changes direction at the point of the load. Answer: c) It increases as it approaches the point of the load.

8. Which theorem is commonly used to determine the shear flow in built-up beams with different materials? a) Pythagorean theorem b) Superposition theorem c) Principle of virtual work d) Saint-Venant's theorem Answer: b) Superposition theorem

9. In a built-up beam, where is the maximum shear flow typically located? a) At the centroid of the cross-section b) At the top flange c) At the bottom flange d) At the interface between materials Answer: d) At the interface between materials

10. How does the distribution of shear flow change in a beam with a closed cross-section compared to an open cross-section? a) It remains the same. b) It becomes linear instead of constant. c) It becomes constant instead of linear. d) It becomes parabolic instead of linear. Answer: c) It becomes constant instead of linear.

UNIT-V

1. What is the primary advantage of using tubular structures in engineering? a) Higher resistance to torsional loads b) Lower material cost c) Easier fabrication d) Reduced weight Answer: a) Higher resistance to torsional loads

2. Which of the following statements is true regarding the behavior of tubular structures under axial loads? a) Tubular structures are weaker than solid structures under axial loads. b) Tubular structures exhibit higher resistance to buckling than solid structures under axial loads. c) Tubular structures experience more deformation than solid structures under axial loads. d) Tubular structures are less stable than solid structures under axial loads. Answer: b) Tubular structures exhibit higher resistance to buckling than solid structures under axial loads.

3. In a tubular structure, which shape of cross-section typically offers the highest resistance to bending? a) Circular b) Rectangular c) Elliptical d) Hexagonal Answer: a) Circular

4. What is the primary function of a cell in structural engineering? a) To increase structural stability b) To provide additional support c) To reduce material usage d) To enhance aesthetic appeal Answer: a) To increase structural stability

5. In cellular structures, what is the term used to describe the spaces enclosed by the cells? a) Voids b) Channels c) Chambers d) Cavities Answer: a) Voids

6. Which of the following is NOT a common material used for constructing tubular structures? a) Steel b) Aluminum c) Concrete d) Timber Answer: d) Timber

7. What is the primary reason for using cellular structures in architectural design? a) To reduce construction costs b) To increase structural strength c) To achieve unique aesthetic effects d) To simplify fabrication processes Answer: c) To achieve unique aesthetic effects

8. How does the behavior of cellular structures differ from that of solid structures under compression? a) Cellular structures collapse more easily under compression. b) Cellular structures exhibit higher resistance to compression. c) Cellular structures deform less under compression. d) Cellular structures experience more buckling under compression. Answer: b) Cellular structures exhibit higher resistance to compression.

9. Which of the following factors is NOT typically considered when designing tubular or cellular structures? a) Shear strength of the material b) Corrosion resistance c) Thermal conductivity d) Density of the material Answer: c) Thermal conductivity

10. What is the term used to describe the arrangement of cells or tubes in a regular pattern within a structure? a) Lattice b) Matrix c) Grid d) Array Answer: a) Lattice