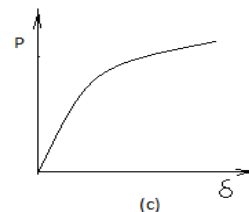
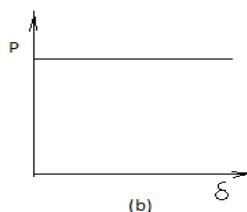
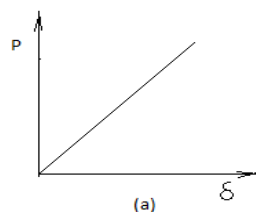


GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV(New) EXAMINATION – SUMMER 2016

Subject Code:2140101**Date:03/06/2016****Subject Name:Aircraft Structures I****Time:10:30 AM to 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**
- 1 The strain energy stored in member up to elastic limit is referred as _____. **01**
(resilience, toughness, yield stress)
 - 2 The total number of free displacement in a structure at a joint represents its _____. **01**
(KI, SI, Equilibrium condition).
 - 3 In beam, the relation between displacement(y) and shear force (F) is _____. **01**
($F = EI d^2y/dx^2$, $F = EI d^3y/dx^3$, $F = EI d^4y/dx^4$)
 - 4 The graphical integration of second moment of M/EI diagram between any to point on elastic curve gives _____. **01**
(relative slope, relative deflection, absolute slope, absolute deflection)
 - 5 The term vibration represents the periodic motion of _____. (Rigid body, Deformable body) **01**
 - 6 The conjugate beam Method of finding beam displacement is generally referred as _____. (Semi-Graphical Method, Static Beam Method, Method of Singularity Function) **01**
 - 7 The effective length of a long column having one end fixed and other is free is _____. ($2L$, L , $0.7L$, $0.5L$). **01**
 - 8 The Maxwell's Reciprocal theorem is valid only if material is _____. **01**
(Linearly elastic, Nonlinear elastic, Plastic)
 - 9 The deformed shape of a determinate beam due to virtual displacement is always _____. (Linear, Nonlinear can be anything). **01**
 - 10 The plane truss is consider as deficient (unstable) if _____. **01**
($m = 2j - 3$, $m > 2j - 3$, $m < 2j - 3$)
 - 11 Which of the following represent the correct load-deformation behavior as per Euler's theory of long column? **01**



- 12 The maximum deflection in conjugate beam is observed at a point at which _____. **01**
(slope is zero, shear force is zero, bending moment is zero)
 - 13 The external static indeterminacy of a structure is w.r.t. it's _____. **01**
(Support condition, Number of member in structure, both on support condition and Number of member).
 - 14 The number of vibration cycles completed in one second is referred as _____. (Time Period (T), frequency (f), maximum amplitude (A)). **01**
- Q.2**
- (a) Explain the Principal of superposition by giving suitable example. **03**
 - (b) Enlist the criteria to identify the geometric Instability of a structure. **04**
 - (c) Find SI and KI of a plane rigid jointed frame and truss as shown in fig.-1 (a) **07**

and (b).

OR

- (c) Comment on stability of a structure as shown in fig.-2 (a) and (b) by giving suitable justification. **07**
- Q.3** (a) Explain the principal of virtual work. **03**
(b) Find the support reaction for a beam as shown in fig.-3 using Principal of Virtual Work. **04**
(c) Analyze the truss as shown in fig.-1(b), using Tension Co-efficient method. **07**
- OR**
- Q.3** (a) Suggest different way of reducing the effect of buckling in long column. **03**
(b) State the difference between Simple Truss, Compound truss and Complex Truss along with suitable sketch. **04**
(c) Analyze the truss as shown in fig.-3, using Graphical Method. **07**
- Q.4** (a) A 2 m long cantilever beam is subjected to 100 kN point load at free end. Determine the vertical displacement at free end using any suitable method. Take $EI = 18000 \text{ kN/m}^2$. **03**
(b) Derive Moment Curvature Relationship of an elastic beam **04**
(c) Find the deflection and slope at point 'C' for a beam as shown in fig.-4 using Moment Area Method. Take $EI = 20000 \text{ kN/m}^2$. **07**
- OR**
- Q.4** (a) A 2 m long cantilever beam is subjected to a concentrated moment 50 kN-m clockwise at free end. Determine the slope at free end using any suitable method. Take $EI = 18000 \text{ kN/m}^2$. **03**
(b) Prove with suitable derivation that the shear force at any point in conjugate beam will give slope in original beam at that point. **04**
(c) Find the deflection at point 'C' and rotation at point 'A' for a beam as shown in fig.-2 using Conjugate Beam Method. Take $EI = 20000 \text{ kN/m}^2$. **07**
- Q.5** (a) Explain De'alembert Principal. **03**
(b) A square column of 100 mm x 100 mm in size and length 8 m with one end support fixed and other hinged is subjected to a axially compression load. Determine the Euler's buckling load. Assume that the column is laterally unsupported throughout its length. Take $E = 200 \text{ kN/mm}^2$. **04**
(c) A solid circular shaft is subjected to a bending moment of 40 kN-m and a torque of 10 kN-m. Design the diameter of shaft according to maximum strain energy theory. Take stress at elastic limit 200 N/mm^2 and Factor of safety 2. **07**
- OR**
- Q.5** (a) A circular ring of radius 'R' is oscillating about one point on its periphery when it get slightly disturb form its original equilibrium position about that point. Derive an equation of time period (T) for the oscillation of ring. **03**
(b) A Steel rod 32 mm in diameter is 3 m long. Find the amount of strain energy stored in member when an axial pull of 80 kN is suddenly applied on it. **04**
(c) A solid circular shaft is subjected to a bending moment of 40 kN-m and a torque of 10 kN-m. Design the diameter of shaft according to maximum principal stress theory. Take stress at elastic limit 200 N/mm^2 and Factor of safety 2. **07**

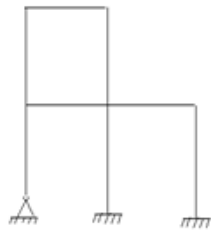


Fig.-1 (a)

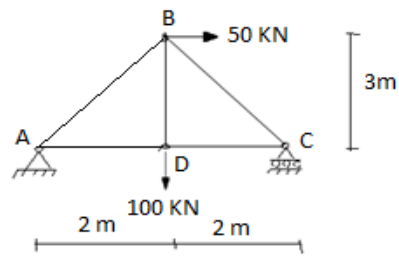


Fig.-1(b)

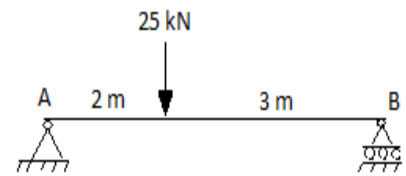


Fig.-3

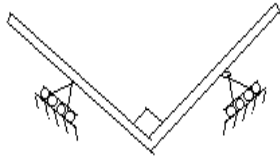


Fig.-2 (a)



Fig. - 2 (b)

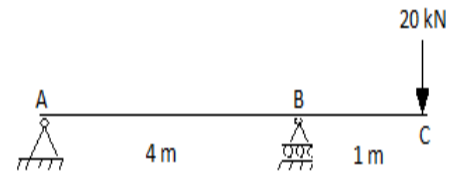


Fig.-4

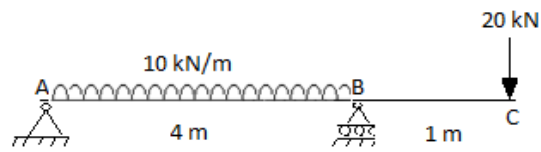


Fig.-5