MANMOHAN TECHNICAL UNIVERSITY
OFFICE OF THE CONTROLLER OF EXAMINATIONS
2081, Jesth
Sample Question

Level: Bachelor | **Year/Part: II/II**
Faculty: School of Engineering | **F.M.: 50**
Program: Civil | **P.M.: 20**
Subject: Theory of Structure (EG551CE) | **Time: 3 Hours**

Group A (Attempt ALL Questions:) $[10 \times 1 = 10]$

Instructions:

- Choose one answer out of four options.
- Use black ball pen for shading only one circle for correct option of a question in Answer Sheet which you have provided.
- No mark will be awarded for cutting, erasing, over writing and multiple circles shading

1) The principle of virtual work can be applied to elastic system considering the virtual work of
   a. Internal forces only b. external forces only c. internal as well external force d. None

2) Bending moment at any section in a conjugate beam gives the actual beam
   a. Slope b. Curvature c. deflection d. Bending moment

3) The ordinate of influence line diagram for bending moment always have the dimensions of
   a. force b. length c force *length d. force/length

4) The principle of superposition is not applicable when
   a. deflection are linear function of applied forces.
   b. materials obey hooks law
   c. the action of applied forces will be affected by small deformations of the structure
   d. none of the above

5) The maximum bending moment due to train of wheel loads on a simply supported girder
   a. Always occur at the centre of span
   b. Always occur under a wheel load
   c. Never occurs under a wheel load
   d. None of the above

6) A three hinged arch is
   a. Statically indeterminate due to central hinge
   b. determinate if the springing's are at the same level
   c. statically determinate
   d. statically determinate or indeterminate due to loading

7) In a cable stretched between two level supports the horizontal tension in cable is
   a. maximum at the centre of cable
   b. same through out

c. maximum at the supporting towers

d. Not predictable

8) In a cantilever beam, a moment M applied at the free end yields a slope at the free end

a. $\frac{Ml}{4EI}$ b. $\frac{Ml}{3EI}$ c. $\frac{Ml}{2EI}$ d. $\frac{Ml}{EI}$

9) In a cantilever beam of span l and flexural rigidity EI the total strain energy under a concentrated load W is

a. $\frac{w^2l^3}{6EI}$ b. $\frac{w^2l^4}{8EI}$ c. $\frac{w^2l^4}{3EI}$ d. $\frac{w^2l^4}{6EI}$

10) On a free body diagram,

a. only external and internal forces are indicated

b. external , internal as well as reaction components are shown

c. only internal forces need be shown

d. only reaction components and external forces are indicated

Group B (Attempt any eight questions) [8*2=16]

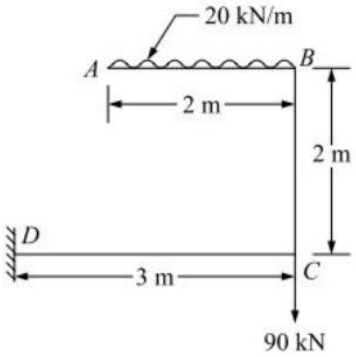
1. Differentiate between linear and nonlinear behavior of structure and explain their uses in theory of structure.
2. Define strain energy. Also derive strain energy due to bending.
3. Explain unit load method. Derive displacement of beam due to temperature effect.
4. What is influence line diagram? Derive the expression of Shear force and bending moment for simply supported beam.
5. Explain the different types of arches used in civil engineering structures.
6. What is the principle of superposition? How is it useful in determination of deflection of beam?
7. State and prove the theorem of moment area method.
8. Show that there is no bending moment at any section in parabolic arch(three hinged arch) subjected to uniformly distributed load over entire span.
9. Explain with neat sketches tower structures as well as wind cables and ties.

Group C (Attempt all questions) [6*4=24]

10. Find the instantaneous maximum deflection and bending stress for 50mm*50mm steel beam of 1m span and simply supported when struck at the mid span by a 150N weight falling from a height of 75mm above the top of the beam. Take E=200GPa. Also, find the maximum deflection and bending stress when the same load is suddenly applied.

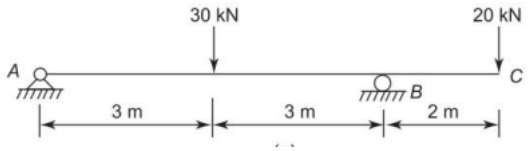
[4]

11. Determine the vertical deflection at A and C in the frame as shown in figure below. Take E=200GPa,I=150*10^4 mm^4.



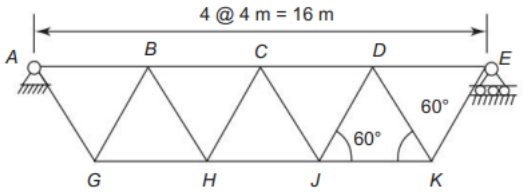
[4]

12. An overhanging beam has the dimensions and loading as shown in Fig below. Using the conjugate beam method, find the slopes at A and B, and the deflection at point C. EI is constant.



[4]

13. For a unit load moving from A to E on the truss shown in Fig below construct influence lines for members BC, CH and HJ.



[4]

14. A three hinged symmetrical parabolic arch of span 10 m has a rise of 3m. Draw influence line diagram of bending moment, radial shear and normal thrust for the section at a distance 2m from the left support. Calculate these internal forces when uniformly distributed load of intensity 15kN/m is acting on the left half of the span using influence line diagram. [4]

15. A Suspension bridge of 120m span has two three hinged stiffening girder supported by two cables having central dip of 12m. The roadway has a width of 6m. The dead load on the bridge is 4 kN/m^2 while the live load is 8 kN/m^2which act on the left half of span. Determine the shear force and bending moment in the girder at 35m from the left end. Also find the maximum tension in the cable for this position of live load.

[4]

**** All the Best ***

Sample Question