

Total No. of Questions: 09

B.Tech. (CE) (2011 Onwards) (Sem.– 4)

STRUCTURAL ANALYSIS – I

M Code: 56088

Subject Code: BTCE-406

Paper ID: [A1176]

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATES:

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION A

1. Write briefly:
 - a) Define Muller Breslau principle.
 - b) What do you understand by determinate structure?
 - c) Describe in brief the significance of influence line diagram.
 - d) A cantilever beam of length 'L' carrying a point load 'W' at a free end. What will be the value of slope and deflection at free end?
 - e) What is middle third rule? Explain in brief.
 - f) What do you mean by retaining structure? Write down different types of retaining walls.
 - g) Define Betti's law.
 - h) How the behavior of an Arch is different from a beam?
 - i) Draw an influence line diagram for a shear force at a distance 'X' from left end of a simply supported beam of length 'L' when a unit load moves from left end to right end.
 - j) Define Maxwell's reciprocal theorem.

SECTION B

2. A suspension cable of 130 m horizontal span is supported at the same level. It is subjected to a uniformly distributed load of 28.5 KN per horizontal meter. If the maximum tension in cable is limited to 5000 KN, Calculate the minimum central dip needed.
3. A retaining wall 5m high has a smooth vertical back. The back fill has a horizontal surface in level with the top wall. There is uniformly distributed surcharged load 38 KN/m^2 intensity over the backfill. The unit weight of the back fill is 18 KN/m^3 . Its angle of shearing resistance is 30° and cohesion is zero. Determine the magnitude and the point of application of active pressure per meter length of the wall.
4. Five wheel loads of 200, 200, 200, 150, and 150 KN spaced 3.50, 2.50, 1.50, and 2.00 meters apart respectively cross a girder of 20 m span from the left to right with 180 KN wheel loading. Calculate the maximum B.M. at the center. Also calculate the position and amount of maximum B.M. anywhere in the girder.
5. A uniformly distributed live load of length 4m and intensity 30 KN/m crosses a beam having a dead load of 20 KN/m and a simply supported span of 12m. Using influence lines, find the maximum shear force and bending moment at a section 3m from the right end, also find the absolute maximum bending moment on the beam.
6. Asymmetrical parabolic arch hinged at springing and crown has a span of 30m. The central rise of the arch is 4m. It is loaded with UDL of 2.5 KN/m on the left 8m length. Calculate:
a) The direction and the magnitude of reaction at the hinges. b) The bending moment, normal thrust and shears at 4m from left end.

SECTION C

7. A suspension cable is supported at two points 25 m apart. The left support is 25m above the right support. The cable is loaded with a UDL of 10KN/m throughout the span. The maximum dip in the cable from left support is 4m. Find the maximum and minimum tensions in the cable.
8. A retaining wall 6.5m high has a smooth vertical back. The backfill has a horizontal level surface, level with the top of the wall. The soil surface is subjected to an external vertical load of 45 KN/m^2 . The soil has an angle of internal friction of 30° and its cohesion is zero. The backfill has a specific weight of 19 KN/m^3 . Find the magnitude and the point of application of active pressure on the wall per meter run of the wall.
9. A suspension cable bridge has a cable of span 100m and dip of 10m. The cable is stiffened by a 3 hinged stiffening girder. Sketch the influence line diagram for B.M. at quarter span of the girder. Determine the maximum moment at this section when a uniformly distributed load longer than span of intensity 10KN/m traverse the span.