Registration no: ☐☐☐☐☐☐☐☐☐☐

Total Number of Pages: 02

2nd Sem Mtech Regular/ Back Examination – 2015-16
ELASTIC STABILITY & BEHAVIOUR OF METAL STRUCTURES
Time: 3 Hours
Max marks: 70
### Q.CODE:W775
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1   Answer the following questions: (2 x 10)
- a) Define the term, *beam-column* and draw a figure for it.
- b) For a beam with simply supported ends subjected to a point load, Q at x from left end, represent the deflection curve in form of a Fourier sine series.
- c) What do you mean by an *ideal column*?
- d) State the *fundamental case of buckling* of a prismatic bar.
- e) Write the expression for flexural rigidity of a plate.
- f) A simply supported beam of length L carries a concentrated load of w at the centre. Find the collapse load.
- g) Define *Load Factor*.
- h) Which property of a material deals with large flow of material at a constant stress?
- i) Calculate the *shape factor* of a circular cross-section.
- j) State the necessary and sufficient conditions for general collapse condition of a structure.

Q2   Develop the basic differential equations for bending of a beam-column. For a beam-column of length, L subjected to a concentrated load , Q at a distance e from right end and an axial force, P, solve the differential equation for the deflection curve.   (3+7)

Q3   Derive the differential equation for lateral buckling of a cantilever beam.   (10)

Q4   Derive the expression for critical load of a column with one end fixed and the other end, free.   (10)

Q5   Derive the governing moment equilibrium equation for the buckling of a thin plate.   (10)

Q6   Find the shape factor for an I beam having width of flange=100mm, overall depth=80mm, thickness of flange=10mm and thickness of web=10mm. If the above I section is used as a simply supported beam of span 6m, find the load factor. The beam carries a point load of 50 KN at the centre of the span. The yield stress of steel as 250 N/mm^2.   (5+5)

Q7   Calculate the collapse load and the plastic moment value for the propped cantilever   (10)
shown   below. EI value is same throughout the beam.
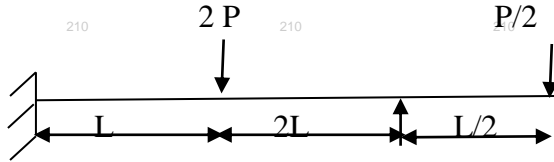
Q8   Write short notes on **any two** of the followings.   (5 x 2)
- a) Warping torsion
- b) Application of trigonometric series
- c) Upper bound theorem
- d) Plastic behavior of a flexural member