Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

II SEMESTER M.TECH.
END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: **ADVANCED STRENGTH OF MATERIALS [CIE 5281]**
(OPEN ELECTIVE)
REVISED CREDIT SYSTEM

(/   /2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.
- All questions carry EQUAL marks

1A.	For the beam loaded as shown in FIG. Q1A, draw the SFD and BMD.
1B.	Determine the shear center for the symmetric section shown in FIG. Q1B.
2A.	Derive the Winkler-Bach formula for beams curved in the plane of loading.
2B.	Determine the principal moments of inertia of the section shown in FIG. Q2B about axes passing through the centroid.
3A.	A simply supported beam has the cross section shown in FIG. Q3A. Draw the shear stress distribution diagram across the section if it carries a shear force of 120 kN.
3B.	A cantilevered beam of span 4 m, 40mm x 60mm deep in cross section, carries a, point load 1 kN at the free end, inclined at an angle of 30° as shown in FIG. Q3B. Determine: (i) the resultant stress due to bending at the points A and B, (ii) orientation of the neutral axis, (iii) magnitude and direction of the resultant maximum deflection.
4A.	Draw the typical shear stress distribution diagrams and write the expressions for maximum shear stress and angle of twist for the following cases of solid sections subjected to torsion: *i)* Rectangle (ii) Ellipse, and (iii) Equilateral Triangle.
4B.	A solid rectangular steel shaft is transmitting power at 150 rpm in lifting a load of 80kN at a rate of 5m/min. If the maximum shear stress is not to exceed 45 MPa, and efficiency of the machine is 75% determine: (i) size of the shaft and (ii) angle of twist per meter length. Take G = 80 GPa, and breadth to height ratio as 1.5.
5A.	Derive expressions for shear stress and angle of twist for a non-circular thin-walled section subjected to pure torsion.
5B.	A circular open steel ring of inner radius 270 mm, and having a cross section shown in FIG. Q5B, is subjected to a compressive load of 150 kN applied on a vertical diameter. Determine the resultant stresses developed at A and B on the principal horizontal diameter.

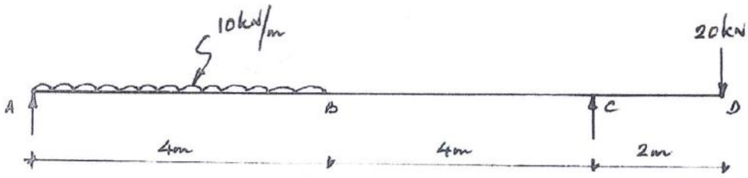

FIG. Q1A

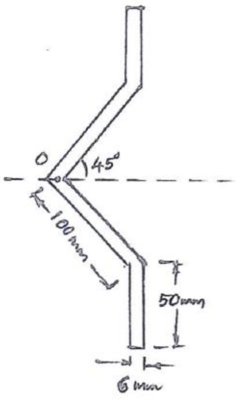

FIG. Q1B

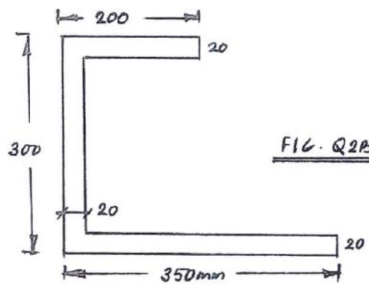

FIG. Q2B

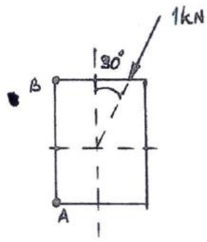

FIG. Q3B

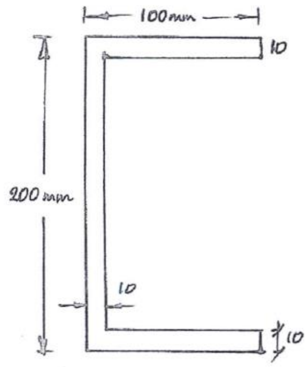

FIG. Q3A

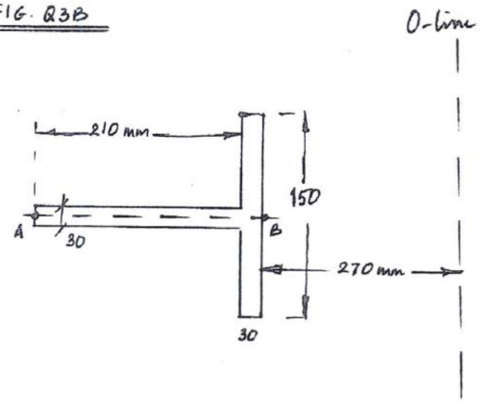

FIG. Q5b