Reg. No: | | | | | | | | | | |

प्रज्ञानं ब्रह्म

Manipal
INSPIRED BY LIFE

MANIPAL INSTITUTE OF TECHNOLOGY

(A Constituent College of Manipal University)

Manipal – 576 104

SECOND SEMESTER M.TECH.

END SEMESTER EXAMINATION MAY/JUNE - 2016

ADVANCED STRENGTH OF MATERIALS (CIE-554)

(OPEN ELECTIVE)

09 - 07 -2016

Time: 3 Hrs.] **[Max. Marks: 50**

Note: 1. Answer **any FIVE FULL** questions.

2. Assume missing data if any, suitably.

1A. A solid rectangular steel shaft is transmitting power at 240 rpm in lifting a load of 75 kN at a rate of 10m/min. If the maximum shear stress is not to exceed 50 MPa, and efficiency of the gearing is 80% determine:
(i) size of the shaft and (ii) angle of twist /m length.
Take G = 80GPa, and b to h ratio as 1.5.

1B. Write a note on torsion of non-circular bars, and draw the shear stress distribution diagram for a shaft whose c/s is an ellipse. (05+05)

2A. A circular open steel ring is subjected to a compressive force of **100** kN applied in the vertical direction as shown in FIG. Q2A. The cross section of the ring is an unsymmetrical I-section with an inner radius of 150 mm. Find the stresses at A and B.

2B. Derive the Winkler-Bach formula as applicable to beams curved in the plane of loading. (05+05)

3A. Draw the shear force, bending moment, and twisting moment diagrams for a cantilevered semi-circular beam subjected to a UDL w/m length over the entire span.

3B. Derive the expressions for shear stress and angle of twist in the case of non-circular thin walled section subjected to torsion. (05+05)

4A. For the beam loaded as shown in FIG. Q4A, draw the SFD and BMD.

4B. The cross section of a cantilever beam is a T-section of overall depth 180 mm, width and thickness of flange 80 mm and 10 mm respectively and thickness of web 10 mm. If the section carries a shear force of 20 kN, and a bending moment of 15 kNm, draw the shear stress and bending stress variation diagrams. (05+05)

5A. The cross section of a cantilever beam of span 2 m is a channel section shown in FIG. Q5A. The loading plane makes an angle of 30^{o} with the vertical centroidal axis. Determine the maximum intensity of UDL the beam can carry if the permissible stresses in tension and compression are 150 MPa and 80 MPa respectively.

5B. Determine the shear center for the symmetric section shown in FIG. Q5B. (05+05)

6A. Determine the principal moments of inertia of the equal angle section 90x90x10mm.
6B. Write a short note on an infinite beam supported on elastic foundation. (05+05)

FIGURES

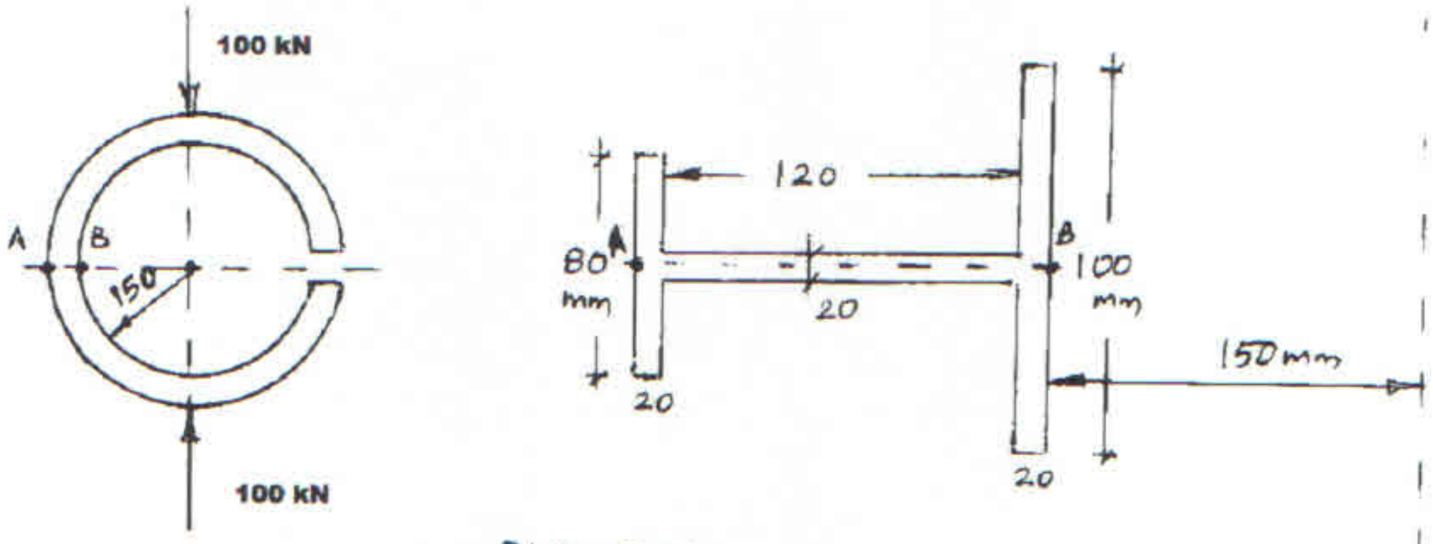

FIG. Q2A

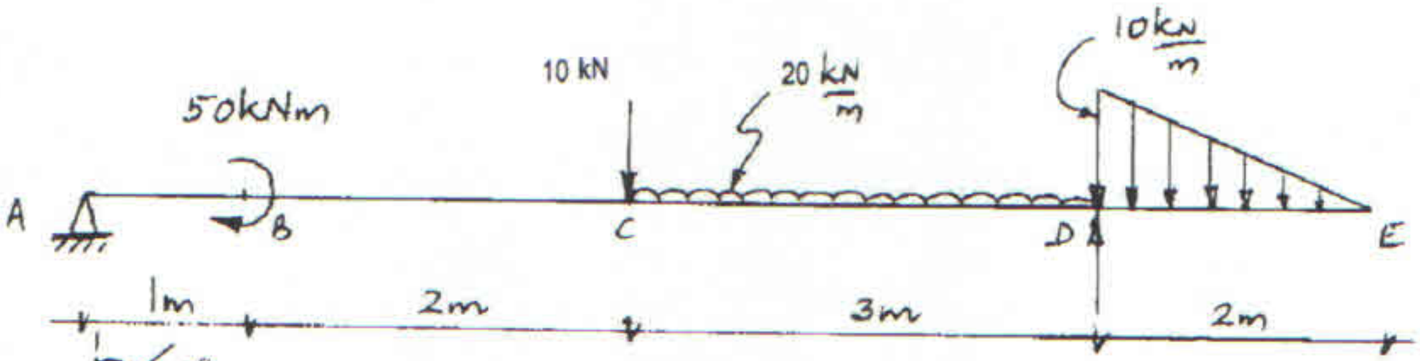

FIG. Q.4A

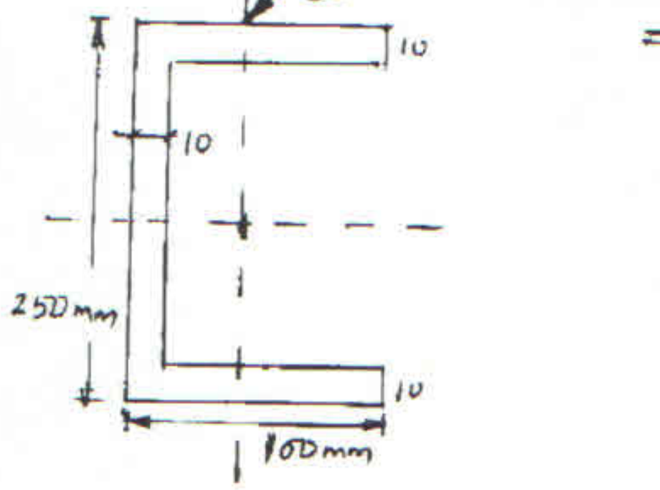

FIG. Q5A

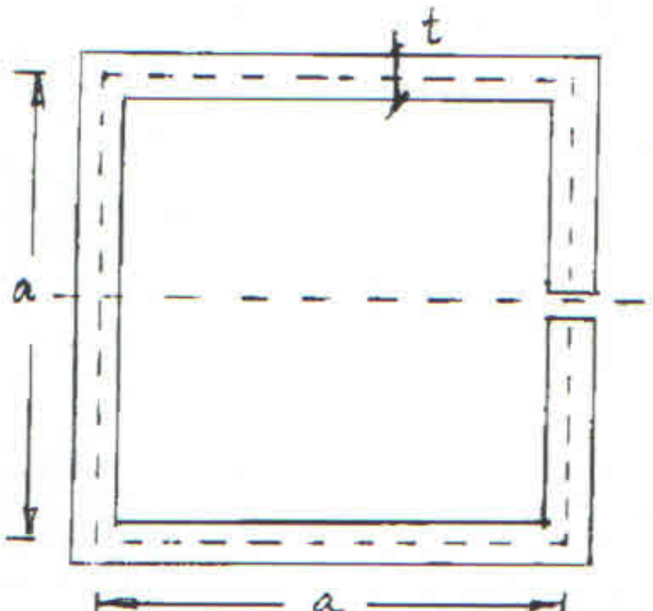

FIG. Q5B