Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: AUTOMOTIVE STRUCTURES AND DESIGN [AAE 2152]

REVISED CREDIT SYSTEM
(30/12/2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data, IF ANY, may be suitable assumed and clearly mentioned.

1A. With a neat sketch, deduce the relation for torque required to lower a load using square threaded screws. **(05)**

1B. With neat sketches briefly explain: Forge welding and 5 types of butt joints. Also, mention the applications of each type of butt joint **(05)**

2A. Briefly explain the 3 types of riveted joint failures with neat sketches. Mention the possible ways to avoid each type of failure. **(05)**

2B. A bracket carrying a load of 15 kN is to be welded as shown in Fig. 1. Find the size of weld required if the allowable shear stress is not to exceed 80 MPa. **(05)**

3A. A shaft is supported on bearings A and B, 800 mm between centres. A 20° straight tooth spur gear having 600 mm pitch diameter, is located 200 mm to the right of the left hand bearing A, and a 700 mm diameter pulley is mounted 250 mm towards the left of bearing B. The gear is driven by a pinion with a downward tangential force while the pulley drives a horizontal belt having 180° angle of wrap. The pulley also serves as a flywheel and weighs 2000 N. The maximum belt tension is 3000 N and the tension ratio is 3: 1. Determine the maximum bending moment and the necessary shaft diameter if the allowable shear stress of the material is 40 MPa. **(07)**

3B. For the above shaft design, draw a line diagram consisting of all forces, reactions, bending moments and torques. **(03)**

4A. A mild steel shaft transmits 20 kW at 200 r.p.m. It carries a central load of 900N and is simply supported between the bearings 2.5 metres apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed 56 MPa. What size of the shaft will be required, if it is subjected to gradually applied loads? **(05)**

4B. A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to 4 P. The span of the beam is 500 mm and its cross-section is circular with a diameter of 60 mm. Taking for the beam material an ultimate stress of 700 MPa, a yield stress of 500 MPa, endurance limit of 330 MPa for reversed bending, and a factor of safety of 1.3, calculate the maximum value of P. Take a size factor of 0.85 and a surface finish factor of 0.9. **(05)**

5A. A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque T. If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to: 1. The maximum principal stress; 2. The maximum shear stress; and 3. The maximum distortion strain energy theory of yielding. **(06)**

5B. Deduce a relation for Soderberg method for combination of stresses. **(04)**

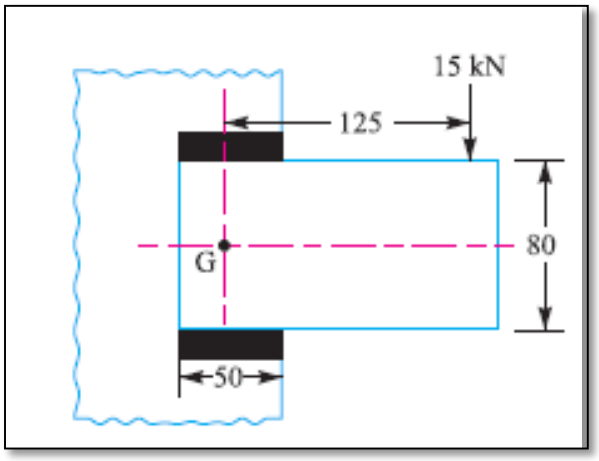

Fig.1