Roll No _____

Examination May-2014

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B. TECH EXAMINATION,

AE 301 AUTOMOTIVE DESIGN-I

Paper ID- A0713

TIME ALLOWED = 3 HOURS MAXIMUM MARKS = 60

NOTE: 1. Question no.1 is compulsory; attempt any ***four*** questions from 'section B' and attempt any ***two*** questions from 'section C'.

2. Use of only P.S.G. design date book is permitted
3. Assume missing data suitably, if any.

Section A

Q1 Attempt all the parts **[2X10]**

i) What are multiple start screws?

ii) List any four guidelines for selection of FOS.

iii) What is positive clutch?

iv) Explain which of the theories of failure is used under what condition.

v) What is self-energizing block brake?

vi) What are the advantages of a clamp coupling?

vii) Explain crushing failure of plate or rivet.

viii) Explain how locking takes place by the use of spring washer?

ix) Draw and label stress-strain curve for a ductile material.

x) Explain what collar friction torque is and how it can be reduced?

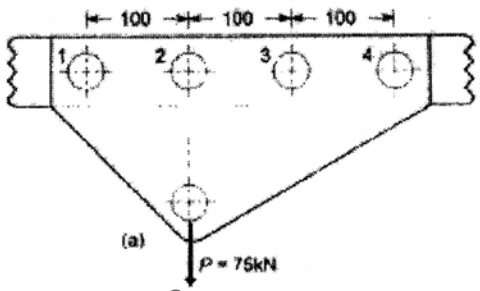
Section B

Q2(a) Discuss the guidelines for design for assembly. **[2]**

(b) Graphically represent the clearance, interference and a transition fits for hole and shaft basis system. **[3]**

Q3 A journal of nominal or basic size of 75 mm runs in a bearing with close running fit. Find the limits of shaft and bearing. What is the maximum and minimum clearance? **[5]**

Q4 Determine the diameter of rivets for a riveted joint subjected to an eccentric force of 75 kN. Assume that rivets are identical and permissible shear stress is 100 N/ mm^2. **[5]**



Q5 Design a muff coupling to connect two shafts transmitting 40 kW at 120 rpm. The permissible shear and crushing stress for the shaft and key material are 30 MPa and 80 MPa respectively. The material of muff is cast iron with permissible shear stress of 15 MPa. Assume that the maximum torque transmitted is 25 percent greater than mean torque.

Q6 State maximum shear stress theory of failure. **[5]**

Section C

Q7 A shaft is supported on bearings A and B, 800 mm between centers. A 20^0 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 (by means of a key) 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 180^0 angle of wrap. The pulley also serves as flywheel and weighs 2 kN. The maximum belt tension is 3 kN and tension ratio is 3:1. The shaft is made of plain carbon steel C05 (S_{yt} = 180 MPa and S_{ut} = 320 MPa). Determine the shaft diameter according to ASME code if it is subjected to gradually applied load. Also draw bending moment diagrams. **[10]**

The permissible angle of twist is 0.35^0 per meter length at G= 80 GPa. Calculate the shaft diameter on the basis of torsional rigidity.

Q8 A multiple disk clutch, steel on bronze is to transmit 4kW at 750 r.p.m. The inner radius of contact is 40 mm and the outer radius is 70 mm. The clutch operates in oil with an expected coefficient of friction 0.10 and the average allowable pressure for operation is 350 kN/m^2. **[10]**

(a) How many total disks of steel and bronze are required?
(b) What is average pressure?
(c) What axial force is required?

Q9 A triple threaded 50 mm nominal diameter coarse series screw is used to lift a load 15 kN. The coefficient of friction between screw and nut is 0.15 and the friction at collar is 0.2. The inner and outer diameters of collar are 100 mm and 65 mm respectively. **[10]**

i) determine the torque required to raise and lower the load
ii) find the force necessary to be applied by a single man to lower the load
iii) determine the efficiency and mechanical advantage of the jack

End