Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 03**

Total No. of Questions : 09

B.Tech.(AE)   (Sem.–5)
# AUTOMOTIVE DESIGN - I
Subject Code : AE-301
Paper ID : [A0713]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**
4. **Use of only P.S.G. design date book is permitted.**
5. **Assume missing data suitably, if any.**

SECTION-A

Q1. Write briefly :

1. What is a brittle material? Give its examples.

2. What are upper and lower deviations?

3. How the effect of keyway is taken care off in designing a shaft?

4. Explain maximum principle theory of elastic failure.

5. Write the manufacturing methods of cotter and knuckle joint?

6. What are applications of square threads?

7. Explain how locking takes place by the use of spring washer?

8. Explain in short the self-energizing block brake.

9. What is the condition of self locking in a screw?

10. Draw and label stress-strain curve for brittle material.

SECTION-B

Q2 What is shaft basis and hole basis system? Which one is preferred and why?

Q3 Calculate the fundamental deviation, tolerance and extreme diameters of shaft and hole for the fit designated by 12H7/n7. Also state the fit and calculate the values of clearance and interference.

Q4 A bracket is welded to the vertical plate by means of two fillet welds as shown in fig.1. Determine the size of the welds if the permissible shear stress is limited to 70MPa.
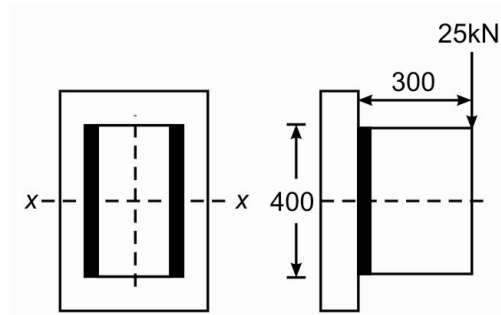
Fig.1

Q5 Explain stress concentration. State the relation between stress concentration factor, fatigue stress concentration factor and notch sensitivity

Q6 What is bolt of uniform strength? How it can be made?

SECTION-C

Q7. A line shaft supporting two pulleys A and B is shown in Fig. below. Power is supplied to the shaft by means of a vertical belt on pulley A, which is then transmitted to pulley B carrying a horizontal belt. The ratio of belt tensions on tight and loose sides is 3 : 1. The maximum tension in belt is limited to 2.7 kN. The shaft is made of plain carbon steel 40C8. The pulleys are keyed to the shaft. Determine the diameter of the shaft according to A.S.M.E code if it is subjected to gradually applied load.
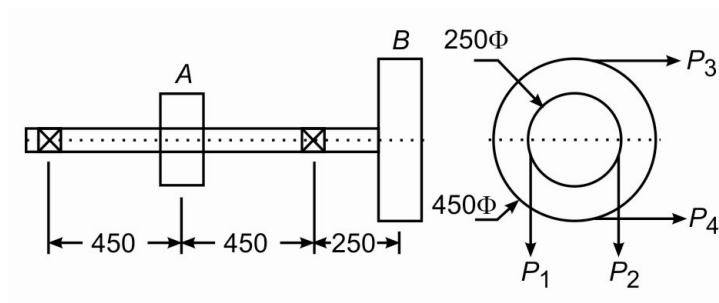
Fig.2

Q8 A multiple disc clutch has three discs on the driving shaft and two on the driven shaft. The inside diameter of the contact surface is 120 mm. The maximum pressure between the surfaces is limited to 0.1 N/mm^2. Design the clutch for transmitting 25 kW at 1575 rpm. Assume uniform wear condition and coefficient of friction as 0.3.

Q9 A protected type rigid flange coupling connects two 50mm diameter lengths of commercial shafts. The coupling webs are bolted together with 4 bolts of same material as the shaft. The bolts are set in finished and reamed holes. The diameter of bolt circle is 240 mm and web thickness is 22 mm.

   i)   Determine the bolt diameter

   ii) Find other dimensions of flange and also check for failure

   iii) What power may be transmitted at 200rpm under steady load conditions?