Sixth Semester B.Tech. Degree Examination, Model Question
(2013 Scheme)

13.602: MACHINE DESIGN (U)

Time: 3Hours   Max.Marks: 100

PART-A
Answer **all** questions. **Each** question carries 2 marks   **(10x2 = 20 Marks)**

1) Define Factor of safety and Margin of safety
2) Differentiate between yield strength and ultimate strength?
3) Define stress concentration factor and stress intensity factor
4) What are the different failure chances of a riveted joint?
5) With a neat sketch, differentiate Lap and butt welded joints
6) Write down the different classifications of springs
7) What do you mean by nipping of a spring
8) What are the basis of classifying a cylinder into thick and thin cylinders
9) What are the different criteria's employed on shaft design
10) Differentiate between sunk key's and saddle key's

PART-B
Answer **one** full question from **each** Module.   **(4x20= 80 Marks)**

Module-1

11) Find the safety factors according to different theories of failure of a shaft of 36mm diameter subjected to an axial load of 100kN and torsion of 180Nm. The shaft is to be made up of C55Mn75 steel   **(20 marks)**

12) Find the diameter of a rod subjected to an axial load varying between 20kN compression and 35kN in tension along with a torque varying between 90Nm and 350Nm. Select a suitable material for the rod and it is supposed to have an ignorance factor of 3. The shaft is having a change in shape due to which a stress concentration factor of 1.3 occurs in it along with a notch sensitivity of 1.2. Take the size correction factor as 0.85 and surface finish factor as 0.9   **(20 marks)**

Module-2

13) Design a bushed pin type flexible coupling to connect two shafts of 40mm diameter and 50mm diameter. Both the shafts are made up of same material. **(20 marks)**

14) Design a single riveted double strap butt joint for the longitudinal shell of a boiler. The shell diameter is 600mm and is subjected to a maximum pressure of 20 bar with a joint efficiency of 70% **(20 marks)**

Module-3

15) Design a leaf spring to support a load of 15000N. The distance between eye centres of the spring is 1100mm and the centre band is 100mm wide. The maximum deflection is limited to 200mm **(20 marks)**

16) **A.** Design a helical compression spring for an IC engine valve. The load on the spring when the valve is in closed position is 120N and when the valve is in open position is 160N.The valve lift is 6mm. The spring should fit into a cavity of 26mm diameter **(15marks)**

B. Explain Autofrettage **(5marks)**

Module-4

17) Design a shaft to be supported between two bearings 5m apart carrying three pulleys B, C and D of respective diameters 400mm, 600mm and 300mm. Pulley B is placed 1m right of left end bearing, transmitting 15kW to a machine just below it. Pulley C is placed 2m left of pulley D transmitting 20kW to a machine in such a way that the drive makes 30^0 with drive from D in downward direction. Pulley D is placed 2m left of right end bearing transmitting 10kW to a machine horizontally right on it. The shaft rotates at 2000rpm. Take coefficient of friction between shaft and the pulley as 0.35 **(20 marks)**

18) **A.** Design a crankshaft for a single cylinder over square engine having an L/D ratio of 0.8, which transmits 15hp at 4000rpm? Take radius of crankshaft as 40mm **(10 marks)**

B. A hollow shaft having a diameter ratio of 0.7 is preferred over a solid shaft of same weight and same material to be used for a propeller shaft of an automobile. State what would have been the probable reason for that? (Hint: Compare the strength and stiffness of the shafts) **(10 marks)**