Day : Thursday   Time : 10.00 AM TO 02.00 PM
Date : 09/05/2019   **S-2019-2685**   Max. Marks : 60

N.B.
1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if necessary.

Q.1 What are the various types of standards in design, why it is important in machine design? **(10)**

OR

A manufacturer is interested to start his business with five different models of tractors from 8.5 to 85 kW capacities. Specify power capacities of models. There is an expansion plan to further increase the number of models from five to nine to fulfill the requirement of farmers. Specify the power of capacities of additional models. **(10)**

Q2 What are the various steps that are include in design of shaft on the basis of strength, rigidity and deflection. **(10)**

OR

What is the design procedure for the design of protected type rigid flange coupling? **(10)**

Q.3 A square threaded, triple start power screw, used in screw jack has a nominal diameter of 45 mm and a pitch of 7 mm. The screw-jack is used to lift a load of 9 kN . The coefficient of thread friction is 0.11 and collar friction is negligible. If the length of nut is 50 mm, calculate : **(10)**
i) maximum shear stress in the screw body.
ii) direct shear stress in screw and nut
iii) bearing pressure.
State whether the screw is self locking.

OR

How will you calculate 'Torque' required to raise the load against thread friction for square thread and for trapezoidal thread? **(10)**

Q.4 A concentric spring comprising two closed coil helical spring of equal free length and made of same material are compressed by 15 mm under the action of 2.5 kN force. Calculate loads on individual springs if spring index for both the spring is 5. **(10)**
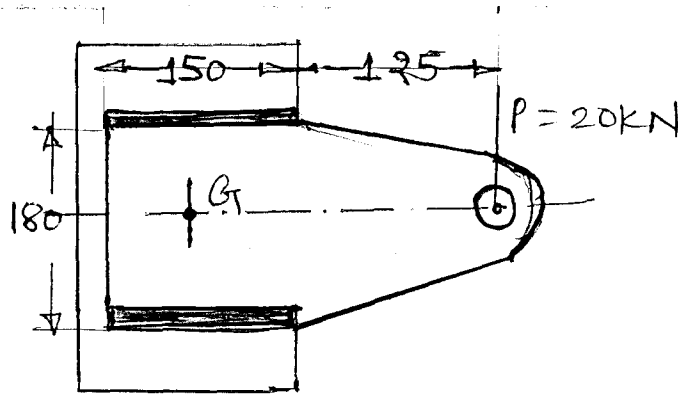Calculate main dimensions, if permissible shear stress in spring material is 240 N/mm^2 and G = 80,000 N/mm^2

OR

How will you calculate deflection of the spring by using castingliano's theorem? **(10)**

Q.5 A bracket is welded to a column as shown in figure. Determine the size **(10)** of the weld, if permissible shear stress in the weld is 80 N/mm².
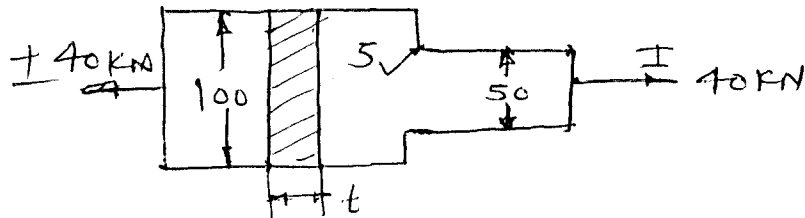

OR

What procedure you will follow for design of welds with in plane eccentric **(10)** loads?

Q6 How will you find out fatigue strength by means of rotating beam fatigue **(10)** testing machine? Show S-N diagram for ferrous materials.

OR

a) What is the relation between endurance limit and ultimate tensile strength? **(05)**

b) A plate made of plain carbon steel 40 C8 (S_{ut} = 580 N/mm²) as shown in **(05)** figure it is subjected to a completely reversed axial force of 40 kN. The theoretical stress concentration factor at the change in cross section is 2.27 and the notch sensitivity is 0.8. The surface finish factor and the size factor are 0.75 and 0.85 respectively. The load factor is 0.923. The expected relatability is 90% for which the reliability factor is 0.897. If the required factor of safety is 2. Determine the plate thickness for infinite life.

* * *