Hall Ticket Number:

Code No. : 31402

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Mech. Engg.) III Year I-Semester (Main) Examinations, Nov./Dec.-2016

Design of Machine Elements

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Discuss the effects of nickel, chromium and manganese in alloy steels.
2. Define the following:
   a) Hardness
   b) Creep
3. Explain the effect of notches in the machine component.
4. Define theoretical stress concentration factor.
5. What do you understand by lateral rigidity of shafts?
6. What is the effect of keyway cut into the shaft?
7. Differentiate between through bolt and stud.
8. Why gibs are used in a cotter joint?
9. What do you understand by overhauling of screw?
10. What are the materials used for screw jack?

Part-B (5 × 10 = 50 Marks)

11. a) Define factor of safety. [2]

    b) A cylindrical shaft made of steel of yield strength 700MPa is subjected to static loads consisting of bending moment 15KN-m and a torsional moment of 35KN-m. Determine the diameter of the shaft using maximum shear stress theory and distortion energy theory. Assume Poisson's ratio as 0.3 for plain carbon steel. [8]

12. a) Draw S-N diagram for a ductile material. [2]

    b) A 50mm diameter shaft is made from carbon steel having ultimate tensile strength of 630MPa. It is subjected to a torque which fluctuates between 2000N-m to -800N-m. Using Soderberg's method, calculate the factor of safety. Assume suitable values for any other data needed. [8]

13. a) List the materials used for keys. [2]

    b) Design a cast iron protective flange coupling to connect two shafts in order to transmit 7.5 kW at 720 r.p.m. The following permissible stresses may be used: [8]
    Permissible shear stress for shaft, bolt and key material = 33 MPa
    Permissible crushing stress for bolt and key material = 60 MPa
    Permissible shear stress for the cast iron = 5 MPa.

14. a) What is bolt of uniform strength. [2]

    b) Two rod ends of a pump are joined by means of a cotter and spigot and socket at the ends. Design the joint for an axial load of 100kN which alternately changes from tensile to compressive. The allowable stresses for the material used are 50MPa in tension, 40 MPa in shear and 100MPa in crushing. [8]

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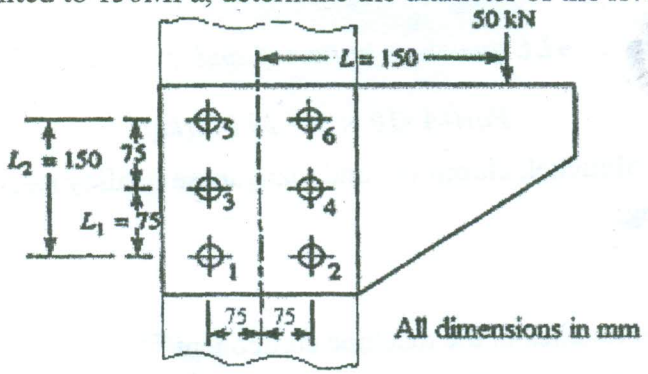
15. a) Differentiate between differential and compound screw. [2]

    b) A bracket is bolted to a column by 6 rivets of equal size as shown in Fig.1. It carries a load of 50 KN at a distance of 150mm from the centre of column. If maximum stress in the rivet is to be limited to 150MPa, determine the diameter of the rivet. [8]



16. a) Derive an expression for the impact stress induced due to falling load. [5]

    b) Illustrate cumulative fatigue of a material. [5]

17. Answer any ***two*** of the following:

    a) Compare solid and hallow shaft and how the shaft is different from an axle. [5]

    b) Discuss the uniform strength of a bolt. [5]

    c) What is the difference between caulking and fullering? Explain with help of neat sketches. [5]