Hall Ticket Number:

Code No. : 15503 O

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Mech. Engg.) III Year I-Semester Old Examinations, May/June-2019

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. What is plain carbon steel? How is it designated according to Indian standards?
2. Define the following:
   a) Toughness
   b) Ductility
3. What is notch sensitivity?
4. Suggest various methods to reduce stress concentration.
5. What do you understand by torsional rigidity of shafts?
6. What is a key? State its functions.
7. Differentiate between tap bolt and stud.
8. Why do we provide slope in cotter and list the standard slope values?
9. What is self-locking property of threads and where is it necessary?
10. Name the materials used for rivets.

Part-B (5 × 10 = 50 Marks)

11. a) Distinguish strength and hardness. [2]
    b) A rotating shaft of 20mm diameter is made of plain carbon steel. It is subjected to a steady torque of 55N-m and maximum bending moment of 70N-m. Calculate the factor of safety according to maximum shear stress theory and distortion energy theory. Assume yield strength as 400Mpa and Poisson's ratio as 0.3 for plain carbon steel. [8]

12. a) list the factors which effect the endurance limit of the materials. [2]
    b) Determine the diameter of a circular rod made of ductile material with a fatigue strength (Complete stress reversal) of 265MPa (σ_e) and a tensile yield strength of 350 MPa(σ_{yt}). The member is subjected to a varying axial load from −300kN to +700kN. The fatigue stress concentration factor is 1.8. Use factor of safety as 2.0. [8]

13. a) List the materials used for shafts. [2]
    b) Design a muff coupling to connect two shafts transmitting 40 kW at 120 r.p.m. The permissible shear stress for the shaft and key material(mild steel) is 30MPa and permissible crushing stress for the key material is 80MPa. 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 the mean torque. [8]

14. a) Explain about bolt of uniform strength. [2]
    b) Design a knuckle joint to connect two mild steel bars under a tensile load of 25kN. The allowable stresses are 65MPa in tension, 50MPa in shear and 83 MPa in crushing. [8]

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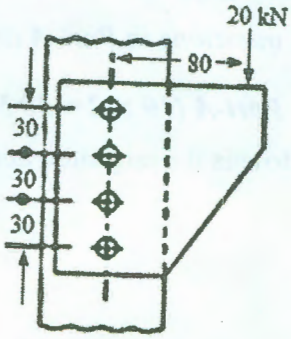
15. a) Why are square threads are preferable to V threads for power transmission. [2]

b) A bracket is supported by means of four rivets of same size as shown below. Determine the diameter of the rivet if the maximum shear stress is 140Mpa. [8]



All dimensions in mm

16. a) List the Important factors that influence the magnitude of factor of safety. [4]

b) Write miner's equation. Discuss in detail the use of miner's equation. [6]

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

a) State the advantages and disadvantages of the chain drive over belt drive. [5]

b) Discuss the possible ways of failure of cotter joints with simple sketches. [5]

c) What do you understand by the term welded joint. How it differs from riveted joint? [5]