

Government College of Engineering, Aurangabad
(An Autonomous Institute of Government of Maharashtra)

T.E. Mechanical Engineering

End Semester Examination Nov- 2016 Semester I

ME 342: Design of Machine Element-I

Max. Marks: 60

Time: Three Hours

15 NOV 2016

“Verify the course code and check whether you have got the correct question paper”

N.B.: -

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if necessary and state it clearly.
4. Use of Non-programmable Calculator is allowed.

Q.1 Attempt any Two

12

- a) Give different types loads and failures modes due to load and explain each with example and neat diagram.
- b) Give different types of theories of failure and compare Max Principal Stress Theory with ‘Strain Energy Theory’ with neat diagram.
- c) Define factor of safety? Give the “Ergonomic factors” considered for design of machine parts? Which factors do you consider for designing ‘Car Seat’?
- d) Draw stress strain diagram for ductile and brittle materials? Explain the criterion of selection of failure for both with neat diagram?
- e) Define Resilience, Toughness, Hardness, Creep, and explain each with neat diagram
- f) Give different design consideration in Manufacturing welded trusses, What different types of welding defects are found due to faulty design? Explain with neat figures?

Q.2 Attempt any One

12

- i) A machine shaft 75mm diameter by 200 mm long and supported at one end as a cantilever. The member is subjected to loads and torsional moment as shown in fig.no.1. Calculate the maximum and minimum numerical values of stresses at point A&B
- ii) Draw the neat diagram of a knuckle joint, the joint is subjected to loads varies from 15kN compressive to 12kN tensile. Design the all parts of joint to carry the loads safely. Give the details of failures. The material of all parts is SAE 1040 having ultimate strength 480 Mpa, shear strength 320Mpa, compressive strength 400 Mpa, and bending strength 350Mpa (Draw the diagrams of resisting areas under failure).

Q.3 Attempt any One

12

- i) A socket & spigot joint subjected to loads varies from 5kN compressive to 8kN tensile. Design the all parts of joint to carry the loads safely. Give the details of failures. The material of all parts is SAE 1010 having ultimate strength 380 Mpa, shear strength 250Mpa, compressive strength 350Mpa, and bending strength 300Mpa (Draw the diagrams of resisting areas under failure).

- ii) Explain Completely Reversed, Repeated, Fluctuating, Alternating loads, with neat diagram how mean and variable stresses are determined from it. Define Endurance Limit, and explain Soderberg's and Goodman's diagrams.

Q.4 Attempt any One

12

- i) A steel hollow shaft of outside dia is twice inside dia; transmitting 8kw at max 1000 rpm is supported on two bearing 1.5 m apart and has two gears keyed to it. The pinion of 30 teeth and 3 mm module is located at 300 mm right from left side bearing and drives power horizontally to the right shaft. The gear having 150 teeth and 2mm module is located at 200 mm left from right side bearing and receives power in vertical direction from below. The allowable shear stress for shaft material is 120Mpa. Determine the diameter of the shaft (Assume additional data if necessary and state it clearly)
- ii) Design screw Jack to lift a load of 200kN. The unsupported length of screw is 20cm, the screw is made up of SAE 1040 material of ultimate tensile strength 550Mpa and nut is of SG 400 CI of ultimate tensile strength 350Mpa, permissible bearing pressure is 10N/mm², The length of handle is 200cm, Check screw and nut for different failures? (Assume additional data if necessary and state it clearly)

Q.5 Attempt any One

12

- i) A plate of 100x80 mm size and 12mm thick is to be welded to another same dimension plate by means of parallel fillet weld. The plates are subjected to a load of 30kN. Find the length of weld so that the maximum stress does not exceeds 60 Mpa. Consider the joint first under static and loading then under fatigue loading.
- ii) Write detail notes on (any two)
- Gear material & Spring Steel
 - Stresses in welded Joints
 - Differential and compound screw
 - Notch sensitivity and stress concentration

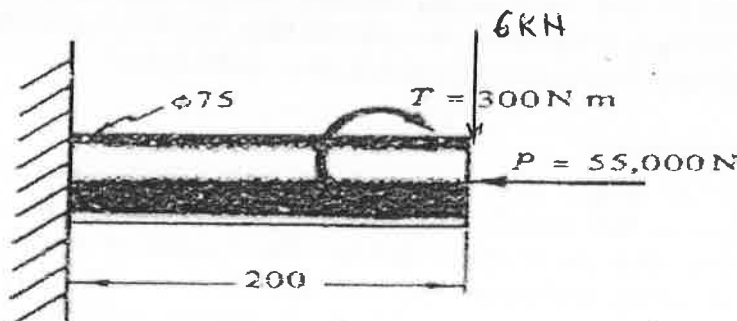


Fig. No.1, Q.No. 2 (i)