

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2018-19 Examination

Semester: 5
Subject Code: 03110301
Subject Name: Machine Design for Agricultural Engineers

Date: 17/05/2019
Time: 10:30 AM to 1:00 PM
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Do as directed.**(15)****Objective Type Questions - (All are compulsory) (Each of one mark)**

1. Shock resistance of steel is increased by adding
 - (a) Nickel and Chromium
 - (b) Nickel
 - (c) Chromium
 - (d) Sulphur, Lead and Phosphorus
2. The Poisson's ratio for steel varies from
 - (a) 0.21 to 0.25
 - (b) 0.25 to 0.33
 - (c) 0.33 to 0.38
 - (d) 0.38 to 0.45
3. Factor of safety is the ratio of _____
 - (a) Working stress and ultimate strength
 - (b) Yield strength and endurance strength
 - (c) Ultimate strength and yield strength
 - (d) Yield strength and working stress
4. Which of the following material has the maximum ductility?
 - (a) Mild steel
 - (b) Copper
 - (c) Zinc
 - (d) Aluminium
5. Stress concentration factor is defined as the ratio of
 - (a) maximum stress to the endurance limit
 - (b) nominal stress to the endurance limit
 - (c) maximum stress to the nominal stress
 - (d) nominal stress to the maximum stress

Fill in the Blanks.

1. In a steam engine, the piston rod is usually connected to the crosshead by means of a _____.
2. Two shafts A and B are made of the same material. The diameter of the shaft A is twice as that of shaft B. The power transmitted by the shaft A will be _____ of shaft B.
3. _____ is used to connect two shafts which have lateral misalignment.
4. In cyclic loading, stress concentration is more serious in _____ material.
5. The parallel fillet welded joint is designed for _____ Strength.

Give the answer in one word.

1. In stress-strain diagram, up to proportional limit, stress is directly proportional to strain. Yes or No?
2. Which type of spring is used in automobile to absorb shocks?
3. Rankine's theory is used for which type of materials?
4. In design process, which process is followed after selecting the material?
5. Which Process improves the machinability of steels, but lower the hardness and tensile strength?

Q.2 Answer the following questions. (Attempt any three)**(15)**

- A) Explain different types of keys with its application.
- B) Define Machine Design. Explain the Phases of Machine Design.
- C) Determine the diameter of a circular rod made of ductile material with a fatigue strength (complete stress reversal), $\sigma_e = 265$ MPa and a tensile yield strength of 350 MPa. The member is subjected to a varying axial load from $W_{min} = -300 \times 10^3$ N to $W_{max} = 700 \times 10^3$ N and has a stress concentration factor = 1.8. Use factor of safety as 2.0.
- D) Explain classification of engineering materials. Write any five mechanical properties of materials.

Q.3 A) A compression coil spring made of an alloy steel is having the following specifications: Mean diameter of coil = 50 mm; Wire diameter = 5 mm; Number of active coils = 20. If this spring is subjected to an axial load of 500 N; calculate the maximum shear stress (neglect the curvature effect) to which the spring material is subjected. (07)

- B) A thin cylindrical pressure vessel of 1.2 m diameter generates steam at a pressure of 1.75 N/mm². Find the minimum wall thickness, if (a) the longitudinal stress does not exceed 28 MPa; and (b) the circumferential stress does not exceed 42 MPa. (08)

OR

B) Write down the Design procedure of Knuckle joint with neat sketch. (08)

Q.4 A) Define shaft and types of shaft. Also write down the design procedure of a shaft subjected to twisting moment only (07)

OR

A) What is stress concentration? Explain methods to relieve stress concentration? (07)

B) Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. (08)