

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

EVENING

[Total No. of Questions: 09]

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Uni. Roll No.

Program: B.Tech. (Batch 2018 onward)

Semester: 5TH

Name of Subject: Design of Machine Elements

Subject Code: PCME-111

Paper ID: 16377

A scientific calculator is Allowed

Detail of allowed codes/charts/tables/data book etc.: Design Data Book is allowed.

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately. The answer should be given to the point.

Part – A

[Marks: 02 each]

Q1.

- a) Define design.
- b) What do you mean by a factor of safety?
- c) What is fatigue?
- d) Give the types of belts.
- e) write two methods to reduce stress concentration.
- f) Discuss the principle of the lever.

Part – B

[Marks: 04 each]

Q2. A leather belt 9 mm × 250 mm is used to drive a cast iron pulley 900 mm in diameter at 336 r.p.m. If the active arc on the smaller pulley is 120° and the stress in the tight side is 2 MPa, find the power capacity of the belt. The density of leather may be taken as 980 kg/m³, and the coefficient of friction of leather on cast iron is 0.35.

Q3. A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of double parallel fillets. The plates are subjected to a static load of 80 kN. Find the length of the weld if the permissible shear stress in the weld does not exceed 55 MPa.

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Q4. How are the keys classified? Draw a neat sketch of a key.

Q5. The following particulars of a single reduction spur gear are given: Gear ratio = 10: 1; Distance between centers = 660 mm approximately; Pinion transmits 500 kW at 1800 r.p.m.; Involute teeth of standard proportions (addendum = m) with pressure angle of 22.5° ; Permissible normal pressure between teeth = 175 N per mm of width. Find :

1. The nearest standard module if no interference is to occur;
2. The number of teeth on each wheel;

Q6. Two plates of 10 mm thickness each are to be joined by means of a single riveted double strap butt joint. Determine the rivet diameter and rivet pitch. Take the working stresses in tension and shearing as 80 MPa and 60 MPa, respectively.

Q7. Give the design procedure for a lever

Part - C

[Marks: 12 each]

Q8. Design a clamp coupling to transmit 30 kW at 100 r.p.m. The allowable shear stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the muff and the shaft surface may be taken as 0.3.

OR

Give the design of the spigot and socket cotter joint.

Q9. Discuss the general procedure in machine design.

OR

Find the diameter of a solid steel shaft to transmit 20 kW at 200 r.p.m. ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameters when the ratio of inside to outside diameters is 0.5.
