

6E 7011	Roll No. _____	[Total No. of Pages : 3]
	6E 7011 B.Tech. VI- Semester (Main&Back) Examination, April - 2019 Automobile Engineering 6AE1A Design of Machine Elements - II Common with AE, ME, PI	

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates:

Attempt any Five questions, selecting One question from each unit. All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.) Units of quantities used/calculated must be stated clearly.

Unit - I

1. a) What is Goodman line? What is the difference between Gerber curve and Soderberg and Goodman Lines? (8)
- b) A solid shaft is subjected to a bending moment of 3.46 KNm and torsional moment of 11.5 KNm. The shaft is made of C-45, and factor of safety is 6. Determine the diameter of the shaft. (8)

(OR)

1. a) What is physical significance of notch sensitivity factor being one and zero. (4)
- b) What is fluctuating stress? Draw stress-time curve for fluctuating stress. (2+2=4)
- c) A hot rolled steel shaft is subjected to a torsional moment that varies from 330N-m clockwise to 110 N-m counter clockwise and an applied bending moment at a critical section varies from 440 N-m to - 220 N-m. Determine the required shaft diameter. The material has an ultimate strength of 550 MN/m² and a yield strength of 410 MN/m². Take endurance limit as half the ultimate strength. FOS = 2 size factor = 0.85, surface finish = 0.62. (8)

Unit - II

2. Design a plain carbon steel centre crankshaft for a single acting four stroke single cylinder for the following data : (16)
 Bore = 400 mm; stroke = 600 mm; Engine speed = 200 rpm, mean effective pressure = 0.5 N/mm²; maximum combustion pressure = 2.5 N/mm²; weight of flywheel used as pulley = 50 kN; Total belt pull = 6.5 kN. When crank has turned through 35° from top dead centre, pressure on the piston is 1 N/mm² and torque on crank is maximum. Ratio of connecting rod length to the crank radius is 5. Assume any other data required for design.

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(OR)

2. Design connecting rod for single cylinder four stroke diesel engine with following specifications:

Power = 7.5 kW, Mechanical eff = 80%, weight of reciprocating parts = 20N, length of connecting rod = 0.30m, speed = 1500 rpm with a possible overspeed of 2500 r.p.m. Assume suitable missing data. (16)

Unit - III

3. Determine width of belt and belt length for the following particulars of a flat belt drive : (16)

Centre distance = 6000 mm, power = 100 kW

Pulley diameters = 420 mm and 1680 mm

Speed of bigger pulley = 240 rpm, Belt thickness = 8mm of leather, coefficient of friction $\mu = 0.3$ Material density $\rho = 0.92 \text{ gm/cm}^3$. Allowable stress in belt = 2.0 N/mm^2 .

(OR)

3. a) Discuss stresses in a helical spring subjected to axial load. (6)

- b) A helical compression spring is made from a wire of 1 mm diameter having yield strength of 720 N/mm^2 . It has mean diameter of 12 mm and there are 14 active coils of spring find : (10)

i) Static load corresponding to yield point.

ii) Deflection.

iii) Stiffness.

iv) Solid height.

v) Free length.

Take $G = 0.84 \times 10^5 \text{ N/mm}^2$. Mention end conditions.

Unit - IV

4. a) List out the assumptions made in Lewis equation for gear design. (6)

- b) Design a 20' spur gear drive to transmit 10 kW from a shaft running at 1440 rpm to another shaft running at 360 rpm. Use C 45 for gear and pinion with suitable F.O.S. (10)

(OR)

4. a) Discuss gear materials and their applications. (6)

- b) A helical pair transmits 20 kW with pinion of 20 teeth and 5 module running at 1200 rpm. Pressure angle is 20° and helix angle is 25° . Compute

i) The Tangential force.

ii) The radial force and

iii) The axial thrust.

Assume suitable positions of gear and pinion and direction of rotation. Accordingly draw a force component diagram. (10)

Unit - V

5. a) Discuss bearing characteristics number. With help of diagram discuss different states of Hydrodynamic lubrication. (6)
- b) Design a journal bearing for supporting a generator shaft of 75 mm diameter with a load of 12 kN running at 1440 r.p.m. Suitable data may be picked from design hand book. (10)

(OR)

5. a) Discuss the types of antifriction bearings and their applications. (8)
- b) Select a suitable antifriction bearing for a radial load of 2000 N with operation at 1200 rpm for 2200 hours. Assume the axial load, if any, to be negligible. (8)

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