CBCS SCHEME

USN | | | | | | | | | | |

18AU63

Sixth Semester B.E. Degree Examination, June/July 2024
Design of Machine Elements – II

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Design a spring used in a Recoil system so as to absorb 120 N-m of energy with a maximum force of 3000 N. Assume spring index 8, FOS = 2, τ_y = 0.55 GPa and G = 79.34 GPa. **(10 Marks)**

b. Design a leaf spring for following specification for a truck, Total load = 120 kN. Number of spring = 4, permissible stress is 0.55 GPa. Span of spring = 1100 mm. Width of centre band = 100mm and allowable deflection 80mm. Number of full length leaves 2. Number of graduated leaves 6. Assume E = 206.92 GPa. **(10 Marks)**

OR

2 a. Discuss the types of clutch. Explain any one with a neat sketch. **(10 Marks)**

b. A multiplate disc clutch has five plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed 0.127 N/mm^2, find the power transmitted at 500 rpm. The outer and inner radii of friction surfaces are 125mm and 75mm respectively. Take μ = 0.3. **(10 Marks)**

Module-2

3 a. A pair of carefully cut spur gears with 20° full depth involutes profile is used to transmit 12 kN at 1200 rpm revolutions per minute of pinion. The gear has to rotate at 300 rpm. The material used for both pinion and gear is medium carbon steel whose allowable bending stress may be taken as 230 MPa. Determine module and fall width of the spur pinion and gear. **(14 Marks)**

b. Write short notes on spur gear and write the Lewis Equation and form factor. **(06 Marks)**

OR

4 a. Define formative number of teeth for Helical gears and write the equation. **(06 Marks)**

b. A pair of helical gears are to transmit 15 kW. The teeth are 20° stub in diameteral plate and have a helix angle of 45°. The pinion runs at 1000 rpm and has 80mm pitch diameter, the gear has 320mm pitch diameter. The gears are made of cast steel of σ = 100 MPa. Determine the suitable module. **(14 Marks)**

Module-3

5 a. Explain the principle of Hydrodynamic Lubrication. **(08 Marks)**

b. Discuss the following terms :
(i) Bearing Characteristics Number (ii) Sommerfield Number
(iii) Coefficient of friction in bearing (iv) Heat generated in bearings. **(12 Marks)**

OR

6 a. Discuss the types of bearings. Explain any two with a neat sketch. **(10 Marks)**

b. List the advantages and disadvantages of Ball, Roller and Needle bearings. **(10 Marks)**

Module-4

7 a. Write short notes on Compensation of Thermal Expansion in Pistons. **(06 Marks)**

b. Determine the thickness of head of a cast iron piston for a single acting 4-stroke engine from the following data:
Cylinder bore = 100m, Stroke = 120mm, BMEP(P_m) = 0.65 N/mm^2,
Maximum gas pressure = 5 N/mm^2, Fuel consumption = 0.227 kg/BP ,
Speed = 2200 rpm, Calorific value = 41870 kJ/kg. **(14 Marks)**

OR

8 a. Discuss about the valves and valve operating mechanism with a neat sketch. **(08 Marks)**

b. Determine the valve lift and valve dimensions of an engine from the following data:
Maximum gas pressure = 5 N/mm^2 , Cylinder bore diameter = 80mm.
Gas velocity = 1500 m/min, Mean-piston speed = 300m/min, Allowable stress = 42 N/mm^2,
Valve seat angle = 33°. **(12 Marks)**

Module-5

9 a. Derive an equation for Buckling of Connecting Rod. **(10 Marks)**

b. Determine the cross-section of a connecting rod (I-section) for a high speed of IC engine using the following data:
Cylinder bore = 125 mm ; Length of connecting rod = 300mm,
Maximum gas pressure = 3.5 MPa , Assume compressive stress σ_c = 330 MPa ;
Factor of safety = 5. **(10 Marks)**

OR

10 a. Write short notes on types of Crankshaft. **(08 Marks)**

b. Design an overhung crank shaft for a 300×350mm single cylinder vertical engine using following data:
Maximum pressure = 2.5 MPa, (L/r) ratio = 4.5 weight of fly wheel, Cam belt pulley =10 kN Total Belt pull = 5 kN, Width of hub for flywheel cam-belt pulley = 150mm. The belts are in horizontal directions. Assume suitable data and state the assumption you make. Assume crank is at TDC and maximum bending moment and no torsional moment. **(12 Marks)**

* * * * *