CBCS SCHEME

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18AU63

Sixth Semester B.E. Degree Examination, June/July 2025
Design of Machine Elements – II

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Explain equalizing the stresses in leaf spring. **(05 Marks)**

b. A spring is subjected to a load varying from 400 N to 1000 N is to be made of tempred steel cold wound wire. Determine the diameter of wire and mean coil diameter of spring for a factor of safety 1.5 spring index 6. Torsional endurance limit is 400 N/mm^2. **(15 Marks)**

OR

2 a. Classify the brakes and name different types of mechanical brakes. **(05 Marks)**

b. The block break as shown below is to balance a torque of 500 Nm on a drum shaft at 1000 rpm. Assuming the coefficient of friction between the break shoe and drum to be 0.25 and 20<60°, determine

(i) Tangential force on shoe.
(ii) Normal force on shoe.
(iii) Force F applied to the brake for clockwise and counter clockwise rotation. **(15 Marks)**

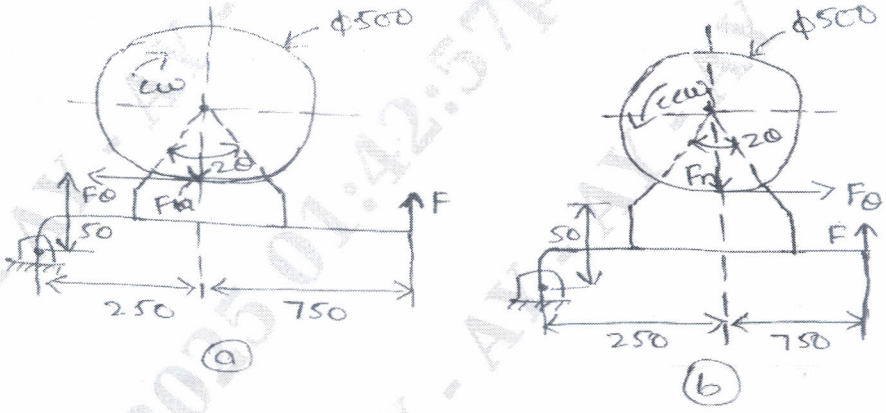

Fig. Q2 (b)

Module-2

3 Design a pair of spur gears to transmit a power of 18 kW from a shaft running at 1000 rpm to a parallel shaft to be run at 250 rpm maintaining a distance of 160 mm between the shaft centres. Suggest suitable surface hardness for the gear pair. **(20 Marks)**

OR

4 Design a pair of helical gear to transmit 12 KW at 2400 rpm of pionion. The velocity ratio required is 4 : 1, Helix angle is 23°. The centre distance is to be around 300 mm, pressure angle in the normal plane is $14\frac{1}{2}^{\circ}$ involute. Pinion material is cast steel ASTM class B. Gear material is cast iron better grade. **(20 Marks)**

Module-3

5 a. List the different forms of lubrication and bearing materials. **(05 Marks)**

b. SAE 20 oil is used to lubricate a hydrodynamic journal bearing of diameter 75 mm and length 75 mm, oil enters at 40°C. The journal rotates at 1200 rpm. The diameter clearance is 75 μm (0.075 mm). Assume operating temperature of the oil as 53°. Determine

(i) Magnitude and location of the minimum film thickness.
(ii) Power loss.
(iii) Oil flow through the bearing.
(iv) Side leakage. **(15 Marks)**

OR

6 a. Derive an expression for sommerfeld number. **(05 Marks)**

b. Design a journal bearing for a centrifugal pump running at 1200 rpm. Diameter of journal is 100 mm and load on bearing is 15 KN. Take L/d = 1.5, bearing temperature 50°C and ambient temperature 30°C. Find whether artificial cooling is required. **(15 Marks)**

Module-4

7 a. What are the functions of piston rings? **(05 Marks)**

b. Design a cast iron piston for a single acting four stroke diesel engine from the following data
Cylinder bore = 100 mm
Length of stroke = 125 mm
Speed = 2000 rpm
Brake mean effective pressure = 0.5 MPa
Maximum gas pressure = 5 MPa,
Fuel consumption = 0.25 kg/ brake power in kW/ hour
Assume any further data required for the design. **(15 Marks)**

OR

8 a. Derive an expression for valve gear mechanism. **(10 Marks)**

b. Explain briefly cam and cam shaft. **(10 Marks)**

Module-5

9 a. Name the materials used for connecting rod. **(05 Marks)**

b. Design a connecting rod for a petrol engine from the following data :
Diameter of piston = 100 mm
Length of connecting rod = 350 mm
Maximum gas pressure or explosion pressure = 3 N/mm^2
Length of stroke = 150 mm
Engine speed = 1500 rpm
Weight of reciprocating parts = 25 N
Compression ratio = 4 : 1
Assume any further data required for the design. **(15 Marks)**

OR

10 a. What is the manufacturing method for crank shaft? **(05 Marks)**

b. Briefly explain the design procedure of crank shaft. **(15 Marks)**

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