SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. III Year II Semester Regular &Supplementary Examinations June-2025
DESIGN OF MACHINE ELEMENTS-II
(Mechanical Engineering)

Time: 3 Hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

1	a	Explain what you understand by A.M. Wahl's factor and state its importance in the design of helical springs.	CO1	L2	4M
	b	A mechanism used in printing machinery consists of a tension spring assembled with a preload of 30 N. The wire diameter of spring is 2 mm with a spring index of 6. The spring has 18 active coils. The spring wire is hard drawn and oil tempered having following material properties: Design shear stress = 680 MPa, Modulus of rigidity = 80 kN/mm^2. Determine: (i) The initial torsional shear stress in the wire. (ii) Spring rate. (iii) The force to cause the body of the spring to its yield strength.	CO1	L5	8M

OR

2	Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, G = 84 kN/mm^2	CO1	L6	12M

UNIT-II

3	A 75mm journal bearing 100mm long is subjected to 2.5kN at 600rpm. If the room temperature is 240°C, what viscosity of oil should be used to limit the bearing surface temperature at 550°C ,D/C=1000.	CO2	L5	12M

OR

4	The ball bearing for the drilling machine spindle is rotating at 3000rpm. It is subjected to radial load of 2500N and an axial load of 1500N. It is to work 50 hours per week for one year. Design a suitable bearing if the diameter of the spindle is 40mm.	CO2	L6	12M

UNIT-III

5	a	List the materials used for belts. How are wire ropes designated?	CO3	L1	6M
	b	Mention the materials used for Sheeve and its characteristics.	CO3	L1	6M

OR

6	A rope drive is to transmit 250 kW from a pulley of 1.2 m diameter, running at a speed of 300 r.p.m. The angle of lap may be taken as π radians. The groove half angle is 22.5°. The ropes to be used are 50 mm in diameter. The mass of the rope is 1.3 kg per metre length and each rope has a maximum pull of 2.2 kN, the coefficient of friction between rope and pulley is 0.3. Determine the number of ropes required. If the overhang of the pulley is 0.5 m, suggest suitable size for the pulley shaft if it is made of steel with a shear stress of 40 MPa.	CO4	L5	12M

UNIT-IV

7	A pair of straight spur gears is required to reduce the speed of shaft from 500 to 100 rpm while continuously running 12hr per day. The pinion is of 40C8 steel and has 20 teeth. The wheel is of cast iron of grade FG200 and has 100 teeth. The gears are of 8mm module, 100 mm face width and 20^0 pressure angle. Calculate power rating.	CO5	L5	12M

OR

| 8 | A pair of gears is to be designed to transmit 30kW for a pinion speed of 1000 rpm and a speed ratio of 5. Design the gear train. | CO5 | L6 | 12M |

UNIT-V

| 9 | a | A pair of Straight bevel gears consists of a 30 teeth pinion meshing with a 48 teeth gear. The gears are mounted on shafts, which are intersecting at right angle. The module at the large end of the tooth is 4mm Calculate:
(i) the pitch circle diameters of the pinion and the gear. (ii) the pitch angles for the pinion and gear; and
(iii) the cone distance. | CO5 | L5 | 8 M |
| | b | List the forces acting on the connecting rod. | CO6 | L6 | 4M |

OR

| 10 | Design a cast iron piston for a single acting four stroke engine for the following data: Any other data required for the design may be assumed. Cylinder bore = 100mm Stroke = 125 mm, Maximum gas pressure = 5 N/mm^2, Indicated mean effective pressure = 0.75 N/mm, Mechanical efficiency = 80%,Fuel consumption = 0.15 kg per brake power per hour Higher calorific value of fuel = 42 × 103 kJ/kg Speed = 2000 rpm Tensile stress for cast iron (σt) = 38 MPa. | CO6 | L6 | 12M |

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