Q.P. Code: 16ME319 **R16**

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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year II Semester Supplementary Examinations February-2022

DESIGN OF MACHINE ELEMENTS-II

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

Note: Design data books are permitted for examinations.

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

UNIT-I

1	**a**	Name the cross sections of flat belt, V-belt, and rope.	**3M**
	b	Design a horizontal belt drive for a centrifugal blower, the belt driven at 600rpm by a 15kw, 1750 rpm electric motor. The Centre distance is twice the diameter of the larger pulley. The density of the belt material =1500kg/m^3 maximum allowable stress = 4MPa. μ_1=0.5 (motor pulley), μ_2=0.4 (blower pulley); peripheral velocity of the belt=20m/s. Determine the following: i. Pulley diameters ii. Belt length iii. Cross sectional area of the belt iv. Minimum initial tension for operation without slip.	**9M**

OR

2	**a**	Write note on design of C- clamps.	**4M**
	b	Explain the design of crane hook.	**8M**

UNIT-II

3	**a**	What are the different bearing materials?	**4M**
	b	Find the "Rating Life" of 50 mm bore, light series ball journal bearing under 6800N radial load at 60 r.p.m. The load is out of balance and therefore rotates with inner ring. There is no shocking load.	**8M**

OR

4	**a**	Name few applications of roller contact bearings.	**4M**
	b	Select a suitable roller bearing for a 55mm diameter shaft, the bearing should be capable of withstanding 3kN radial load and 1.5kN axial load at 750 rpm. The bearing is to have a desired rated life of 2000hrs at reliability of 94%. There is a light shock load and inner ring rotates.	**8M**

UNIT-III

5		The following data is given for the piston of a four-stroke diesel engine: Cylinder bore = 250 mm Material of piston rings = Gray cast iron Allowable tensile stress=100N/mm^2 Allowable radial pressure on cylinder wall = 0.03 MPa Thickness of piston head = 42 mm and no of piston rings = 4 Calculate: (i) Radial with of piston rings. (ii) Axial thickness of piston rings. (iii) Gap between the ends of piston rings before and after assembly. (iv) Width of the top land. (v) Width of the ring grooves. (vi) Thickness of the piston barrel and thickness of the barrel open end.	**12M**

OR

6 Design a I-section of a connecting rod for an I.C engine using the following data: Piston diameter = 125 mm **12M**
Stroke = 150 mm
Length of connecting rod = 300 mm
Gas pressure = 5 N/mm^2
Speed of engine = 1200 rpm
Factor of safety = 5 and material is steel 35 NiCr60.

UNIT-IV

7 It is required to design a helical compression spring with plain ends, made of cold drawn plain carbon steel, for carrying a maximum pure static force of 1000 N. The ultimate tensile strength and modulus of rigidity for spring material are 1430 N/mm^2 and 85 N/mm^2 respectively. The spring rate is 48 N/mm. If spring index is 5, **12M**
determine: (i) Wire diameter.
(ii) Total number of coils.
(iii) Free length and
(iv) Pitch. Draw a neat sketch of spring with necessary dimensions.

OR

8 Design and draw a valve spring of a petrol engine for the following operating conditions: **12M**
Spring load when the valve is open = 400 N
Spring load when the valve is closed = 250 N
Maximum inside diameter of spring = 25 mm
Length of the spring when the valve is open= 40 mm
Length of the spring when the valve is closed= 50 mm
Maximum permissible shear stress = 400 MPa

UNIT-V

9 A helical gear set used in a paper pulping machine connects the driving motor to the blade shaft. A power of 20kW is transmitted by the motor at 1600rpm while the blade shaft runs at 400rpm. Due to space restrictions the center distance between the gears is kept at 500mm. choosing suitable materials for the gears design the 20^0 full depth involute helical gears with a helix angle of 25^0. **12M**

OR

10 A motor shaft rotating at 1500 r.p.m. has to transmit 15 kW to a low-speed shaft with a speed reduction of 3:1. The teeth are 14.5^0involute with 25 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe stress of 200 MPa. A safe stress of 40 MPa may be taken for the shaft on which the gear is mounted and for the key. Design a spur gear drive to suit the above conditions. Also sketch the spur gear drive. Assume starting torque to be 25% higher than the running torque. **12M**

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