Exam.Code:0942
Sub. Code: 7058

2062

B.E. (Mechanical Engineering)

Sixth Semester

MEC-601: Design of Machines Elements – II

Time allowed: 3 Hours

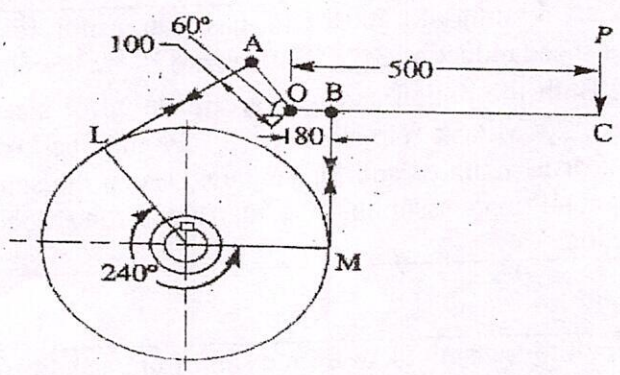
Max. Marks: 50

NOTE: *Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of design data book is allowed.*

x-x-x

I.		Write briefly:	
	a.	What do you understand by 6x37 rope.	
	b.	State any two advantages of hydrodynamic bearings over hydrostatic bearings.	
	c.	What is a self-energizing brake.	
	d.	What is solid length of a helical spring. How is it different than the compressed length.	
	e.	The cross section of the arm of a flat belt pulley is usually elliptical with major axis in the plane of rotation. Why.	**(2x5)**
		PART A	
II.		A motor shaft rotating at 1500 r.p.m. has to transmit 15kW to a low speed shaft with a speed reduction 3:1. The teeth are $14\,1/2^{\circ}$ involute with 25 teeth on the pinion. Both the pinion and gear are made up of steel with a maximum safe stress of 200MPa.A safe stress of 40MPa may be taken for the shaft on which the gear is mounted and for the key. Design the spur gear drive to suit the above conditions assuming the starting torque 25% greater than the running torque.	**(10)**
III.	a.	Select a V belt to transmit 9kW from a shaft from a shaft rotating at 1200 rpm to a parallel shaft to run at 300rpm. The diameter of smaller pulley is 120 mm. The centre distance between shafts is 1.2m.	**(7)**
	b.	Explain the chordal action in chain drives.	**(3)**
IV.	a.	A journal bearing is proposed for a centrifugal pump. The diameter of the journal is 0.15 m and the load on it is 40 kN and its speed is 900 rpm. Complete the design calculation for the bearing.	**(8)**
	b.	For a ball bearing explain (i) static load carrying capacity (ii) dynamic load carrying capacity.	**(2)**

P.T.O.

		PART-B	
V.	a.	What is nipping. Explain the objective of nipping of a leaf spring.	(4)
	b.	A vertical spring loaded valve is required for a compressed air receiver. The valve is to start opening at a pressure of 1 N/mm^2 gauge and must be fully open with a lift of 4 mm at a pressure of 1.2 N/mm^2 gauge. The diameter of the port is 25 mm. Assume the allowable shear stress in steel as 480 MPa and shear modulus as 80 kN/mm^2. Design a suitable close coiled round section helical spring having squared ground ends.	(6)
VII.		A differential band brake is operated by a lever of length 500 mm. The brake drum rotating in anticlockwise direction has a diameter of 500 mm and the maximum torque on the drum is 1000 N-m. The band brake embraces2/3rd of the circumference. One end of the band is attached to a pin 100 mm from the fulcrum and the other end to another pin 80 mm from the fulcrum and on the other side ofit when the operating force is also acting. If the band brake is lined with asbestos fabric having a coefficient of friction 0.3, find the operating force required. Design the steel band, shaft, key, lever and fulcrum pin. The permissible stresses may be taken as 70 MPa in tension,50 MPa in shear and 20 MPa in bearing. The bearing pressure for the brake lining should not exceed 0.2 N/mm^2.  All dimensions in mm.	(10)
VIII.		Design a connecting rod for an I.C engine running at 1500 r.p.m and developing a maximum pressure of 3 N/mm^2. The diameter of piston is 100mm, mass of reciprocating parts per cylinder 2.25kg , length of connecting rod=380mm ,stroke of piston=190mm and compression ratio is 6:1.Take factor of safety =6, length to diameter ratio for big end bearing is 1.3 and for the small end bearing as 2 and the corresponding bearing pressure are 10MPa and 15 MPa respectively. The density of the rod material may be taken as 8000kg/m^3 and the allowable stress in bolts and cap as 50MPa and 75Ma respectively.	(10)

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