INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

MECHANICAL ENGINEERING

ASSIGNMENTS

Course Name	:	**DESIGN OF MACHINE MEMBERS-II**
Course Code	:	**A60329**
Class	:	III B.Tech II Semester
Branch	:	Mechanical Engineering
Year	:	2017 – 2018
Course Coordinator	:	Dr.G.V.R.Seshagiri Rao , Professor, Department of Mechanical Engineering
Course Faculty	:	Dr.G.V.R.Seshagiri Rao Professor , Ms.Krishnaja, Assistant Professor

COURSE OVERVIEW:

The design of machine members-II focus mainly on design of power transmitting elements like gears, connecting rod, crankpin, crankshafts, pistons, cylinders, bearings, belts, ropes, chain's, pulleys, Power screws and nuts. Design basis is strength and stiffness of the parts and selection of material for manufacture of machine elements.

ASSIGNMENT-I

S. No	Question	Bloom Taxonomy Level	Course Outcome
1	1) a. What is meant by hydrodynamic lubrication? b. The load on the journal bearing is 150 KN due to turbine shaft of 300 mm diameter running at 1800 r.p.m. Determine the following : i) Length of the bearing if the allowable bearings pressure is 1.6 N/mm^2, and ii)Amount of heat to be removed by the lubricant per minute if the Bearing temperature is 60^0C and viscosity of the oil at 60^0C is 0.02 kg/ms and the bearing clearance is 0.25 mm.	Understand	1
2	a. What are rolling contact bearings? Discuss their advantages over Sliding contactbearings. b. A Shaft rotating at constant speed is subjected to variable load.The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is 20 x 10^6 revolutions at 95 per cent reliability, calculate dynamic load rating of the ball bearing.	Understand	1
3	a. Explain the various types of cylinder liners. b. Design a connecting rod for an I.C. engine running at 1800 r.p.m and developing a maximum pressure of 3.15 N/mm2. The diameter of the piston is 100 mm; mass of the reciprocating parts per cylinder 2.25kg; length of connecting rod 380 mm; stroke of piston 190 mm and compression ratio 6:1. Take a factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressures as 10N/mm2 and 15 N/mm2. The density of material of the rod may be taken as 8000kg/m3 and the allowable stress in the bolts as 6 N/mm2 and in cap as 80 N/mm2. The rod is to be of I-section for which you can choose your own proportions. Draw a neat dimensioned sketch showing provision for lubrication. Use Rankine formula for which the numerator constant may be taken as 320 N/mm2 and the denominator 1/7500.	Understand	2
4	a. Discuss about the various types of belt drives with neat Sketches? b. A belt, 100 x 10mm is transmitting power at 15m/s. the angle of contact on the driver (smaller) pulley is 156^0, if the permissible stress for the belt material is $2N/mm^2$; determine the power that can be transmitted at this speed. Tale the density of leather as $1000kg/m^3$ and coefficient of friction as 0.25. Calculate the maximum power that can be transmitted.	Understand	3

5	a) Name the type of stresses induced in the wire? b) A roller chain operating under steady load conditions transmits 4kW from a shaft rotating at 600rev/min to one operating at 750rev/min. i. Determine the chain required using at least 15 teeth in sprockets. ii. Determine the sprocket pitch diameters. iii. Determine the shortest advisable centre distance. iv) Determine the number of links of chain required.	Understand	3

ASSIGNMENT-II

S. No	Question	Blooms Taxonomy Level	Course Outcome
1	a. Discuss the design procedure of spur gears? b. The following particulars of a single reduction spur gear are given, Gear ratio=10:1; Distance between centers =660mm approximately; pinion transmits 500kw at 1800rpm; Involutes teeth of standard proportions (addendum=1m) with pressure angle of 22.5^0; Permissible normal pressure between teeth =175N per mm of width. Find i. The nearest standard module if no interference is to occur. ii. The number of teeth on wheel; iii. The necessary width of pinion iv. The load on the bearings of the wheels due to power transmitted.	Understand	1
2	a. Explain the following terms used in helical gears. (i). Helix angle (ii) Normal Pitch (iii) Axial Pitch b. A pair of helical gears is to transmit 15KW. The teeth are 20^0 stub in diametric plane and have a helix angle of 45^0. The pinion runs at 10,000rpm and has 8mm pitch diameter. The gear has 320mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100Mpa.Determine a suitable module and face width from static strength considerations.	Understand	1
3	a) Define the following terms used in worm gearing? i) Lead ii) Lead angle iii) Normal pitch iv) Helix angle b) Explain efficiency of worm gearing?	Remember	2
4	a. A vertical screw with single start square threads of 50mm mean diameter and 12.5 pitch is raised against a load of 10KN by means of a hand wheel, the boss of which is threaded to act as nut. The axial load is taken up by a thrust collar which supports the wheel boss and has a mean diameter of 60mm. The coefficient of friction is 0.15 for the screw and 0.18 for the collar. If the tangential force applied by each hand to the wheel is 100N, Find suitable diameter of the hand wheel. b. Show that the efficiency of self locking screws is less than 50%.	Understand	3
5	a. What are the various forces acting on a bevel gear? b. A pair of cast iron bevel gears connect 2 shafts at right angles, The pitch diameters of the pinion and gear are 80mm and 100mm respectively. The tooth profiles of the gears of $14\ 1/2^0$ composite form. The allowable static stress for both the gears is 55Mpa. If the pinion transmits 2.75kw at 1100rpm. Find the module and number of teeth on each gear from the stand point of strength.	Understand	3

Prepared by:

Dr.G.V.R.SeshagiririRao , Professor
Ms. D. Krishnaja, Assistant Professor.

HOD, MECHANICAL ENGINEERING