Hall Ticket Number :										

R-14

Code: 4G565

III B.Tech. II Semester Supplementary Examinations January 2022

Design of Machine Elements-II

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Explain wedge film and squeeze film journal bearings.	6M	CO1	L2
	b)	List the design procedure for a Journal bearing.	8M	CO1	L1
		OR			
2.		A full Journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4 N/mm^2.The speed of the journal is 900 rpm and the ratio of the journal diameter to the diametral clearance is 1000.The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75^{0}C may be taken as 0.011kg/m-s. The room temperature is 35^{0}C.Determine the amount of artificial cooling required and the mass of the lubricating oil required if the difference between the outlet and inlet temperature of the oil is 10^{0}C.The specific heat of the oil as 1850 J/kg/^{0}C	14M	CO1	L5
		UNIT–II			
3.	a)	Explain the different types of antifriction bearings.	6M	CO2	L2
	b)	Determine the dynamic load carrying capacity of a deep groove ball bearing with the least bore size, and which is required to resist a radial load of 4 kN and an axial load of 3 kN. The shaft rotates at 1400 rpm. The bearing is required to be in operation for 12000 hours with 90% reliability.	8M	CO2	L5
		OR			
4.	a)	A bearing is required to carry 4500 N stationery radial load. The shaft rotates at 1000 rpm and the life desired is 30000 hrs. The running conditions are steady, no shock loading. Select a suitable bearing.	7M	CO2	L5
	b)	A single row deep groove ball bearing No.6002 is subjected to an axial thrust of 1000 N and a radial load of 2200 N. Determine the expected life that 50 % of the bearings will complete under this condition.	7M	CO2	L1
		UNIT–III			
5.	a)	Explain about the stress due to whipping action on connecting rod ends.	4M	CO3	L2
	b)	Estimate the design of a Cast Iron piston for a single acting four stroke engine for the following data : Cylinder bore = 100 mm, stroke = 125 mm, Maximum gas pressure=5N/mm^2, Indicated Mean effective pressure=0.75N/mm^2, Mechanical efficiency=80%, Fuel consumption = 0.15 kg per brake power per hour, Higher calorific value of fuel =42X10^3 kj/kg, speed=2000 rpm. Any other data required for the design may be assumed.	10M	CO3	L5
		OR			
6.		Describe the design procedure of a Connecting rod with a neat sketch.	14M	CO3	L1

UNIT–IV

7. Estimate the design of a helical spring for a spring loaded safety valve for the following conditions:
   Diameter of valve seat = 65 mm
   Operating pressure = 0.7 N/mm^2
   Max. pressure when the valve blows off freely = 0.75 N/mm^2
   Max. lift of the valve when the pressure rises from 0.7 to 0.75 N/mm^2=3.5 mm
   Max. allowable stress = 550 MPa
   Modulus of rigidity = 84 kN/mm^2
   Spring index = 6 — 14M CO4 L6

OR

8. a) Explain the selection criterion for the belt drives. — 4M CO4 L2
   b) A V-belt is driven on a flat pulley and a V-pulley. The drive transmits 20 kW from a 250 mm diameter V-pulley operating at 1800 rpm to a 900 mm diameter flat pulley. The centre distance is 1m,the angle of groove is 40^0 and $\mu = 0.2$, if density of belting is 1110 kg/m^3 and allowable stress is 2.1 MPa for belt material, determine the number of belts required if C-size V-belts having 230mm^2 cross-section area are used. — 10M CO4 L5

UNIT–V

9. A gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1:2 and rpm of this pinion is 200.The approximate centre distance between the shafts may be taken as 600 mm. The teeth has 20^0 stub involute profiles. The static stress for the gear material (which is Cast Iron) may be taken as 60 MPa and face width is 10 times the module. Determine the module, face width and no. of teeth on each gear. Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4. — 14M CO5 L5

OR

10. A helical cast steel gear with 30^0 helix angle has to transmit 35 kW at 1500rpm. If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20^0 full depth involute teeth. The static stress for Cast steel may be taken as 56 MPa. The width of face may be taken as 3 times the normal pitch. Determine the end thrust on the gear? — 14M CO5 L5

END