

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Advanced Machine Design	Semester: I
Program: M. Tech – Rotating Equipment’s	Time 03 hrs.
Course Code: MERE 7003	Max. Marks: 100

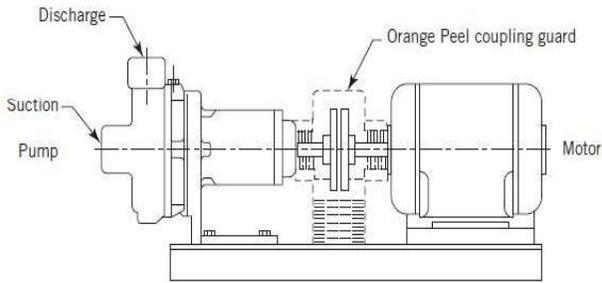
Instructions:
Design Data Hand Book by K. Mahadevan, K. Balaveera Reddy is allowed.
ASSUME ANY DATA WHICH IS NOT GIVEN

SECTION A

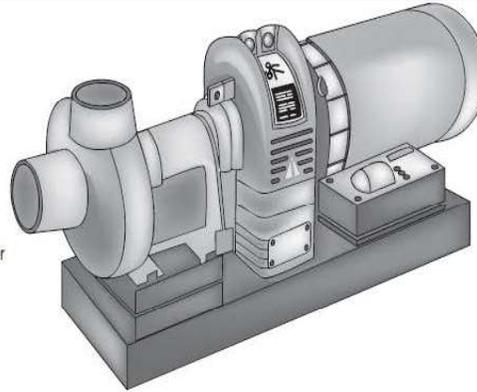
S. No.		Marks	CO
Q 1	Explain the various components of forces acting on a helical gear with a neat diagram.	5	CO1
Q 2	Explain the reasons for considering dynamic load in gears design.	5	CO1
Q 3	Explain the Bearing Characteristics no. (ZN/p) and its significance to design the journal bearing for various loading conditions?	5	CO1
Q 4	Explain with the help of schematic diagram, the operation of a hydrostatic lubrication for an industrial application?	5	CO1
Q 5	An industrial motor of 100 KW at 800 rpm, is used to run a degreasing roll. Due to some imbalance in weight of roll, the levels of vibrations in the system are on higher side. This situation may can lead to small lateral misalignment between roll shaft and motor shaft. Considering the current situation, select an appropriate coupling to connect the two shafts and explain about the selection made. Also complete the design of selected coupling by selecting an appropriate material.	10	CO2

SECTION B

Q 6	Select a ball bearing for an industrial machine press fit onto a shaft and intended for life of 10000 hours at 1800 rpm. Radial and thrust loads are 1.2 and 1.5 kN, respectively, with light-to-moderate impact.	15	CO2
Q 7	Figure below shows a 25 KW electric motor driving a centrifugal pump with a coupling connecting the two shafts. The normal rotational speed of the drive motor is 1800 rpm. Design the rigid flange coupling by choosing an appropriate material. <p style="text-align: center;">OR</p> Design the flexible bush coupling by choosing an appropriate material.	15	CO3

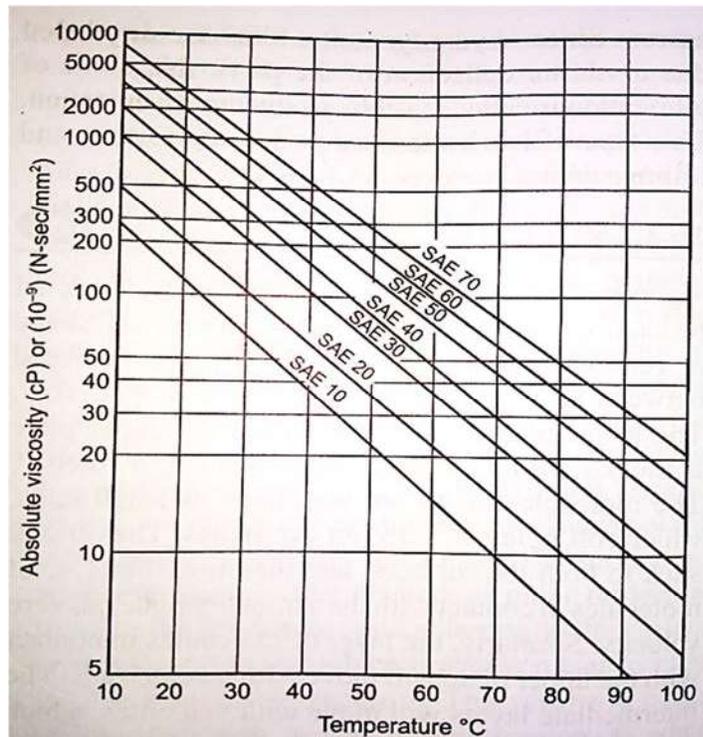
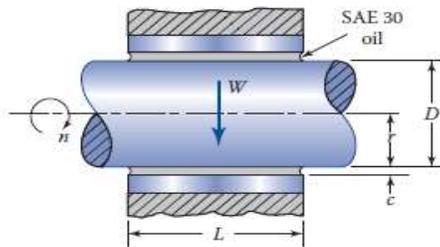


(a) Side view



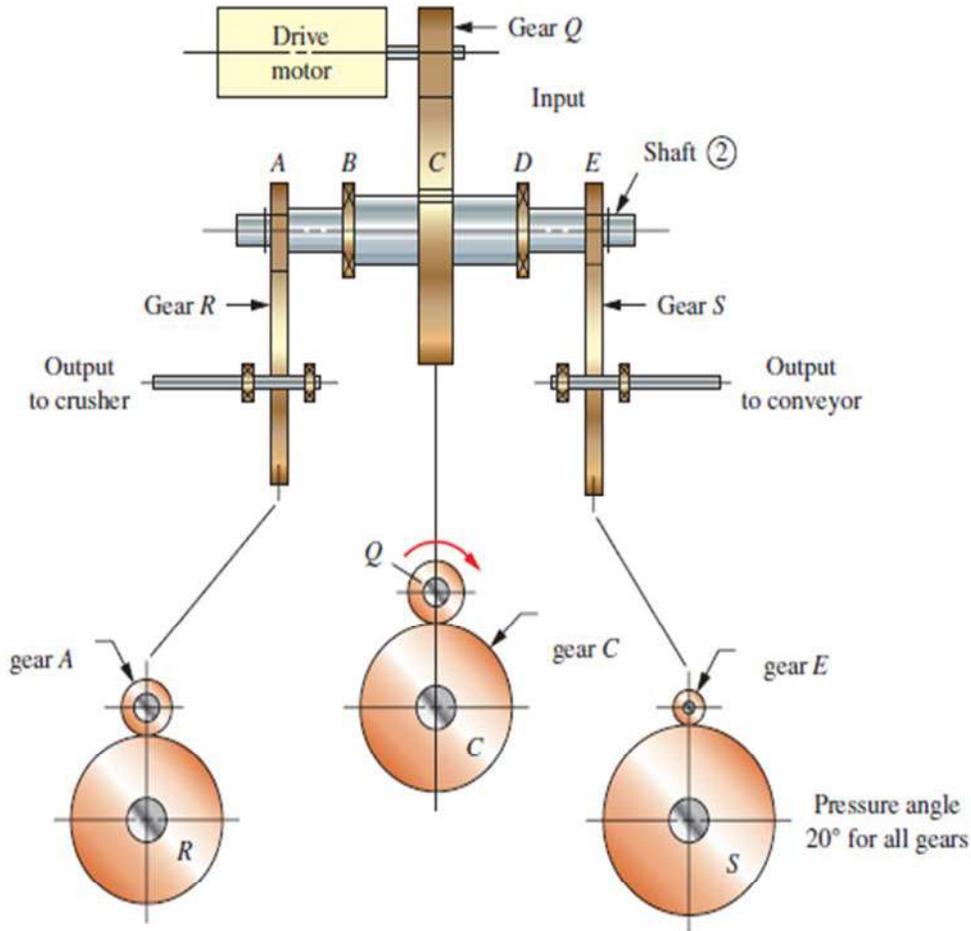
(b) Pump assembly

Q 8 A full-journal bearing of diameter D as 60 mm, carries a load of W of 3.6 kN at a speed of $n = 30$ rps. It is lubricated by **SAE 30 oil**, supplied at atmospheric pressure, and the average temperature of the oil film is $t = 80^\circ\text{C}$. Design the bearing by choosing an appropriate material for bearing. Ambient temperature is 25°C [Refer to the viscosity temperature graph as shown in the figure below]



SECTION-C

Q 9 Figure below shows a drive for a system to crush coal and deliver it by conveyor to a railroad car. Gear A delivers 15 kW to the crusher through a helical gear and gear E delivers 7.5 kW to the conveyor through a spur gear arrangement. All power enters the shaft through gear C. The shaft carrying gears A, C, and E rotates at 480 rpm.



The center distance between the gear A and R is 200 mm, and gear R rotates at 160 rpm. Design the pair of gear for the conveyor system.

OR

Design the pair of gear for the crusher system. Consider gear S rotates at 120 rpm and helix angle as 30° and center distance between the gear E and S is 200 mm.

25

CO3