

Name:	
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

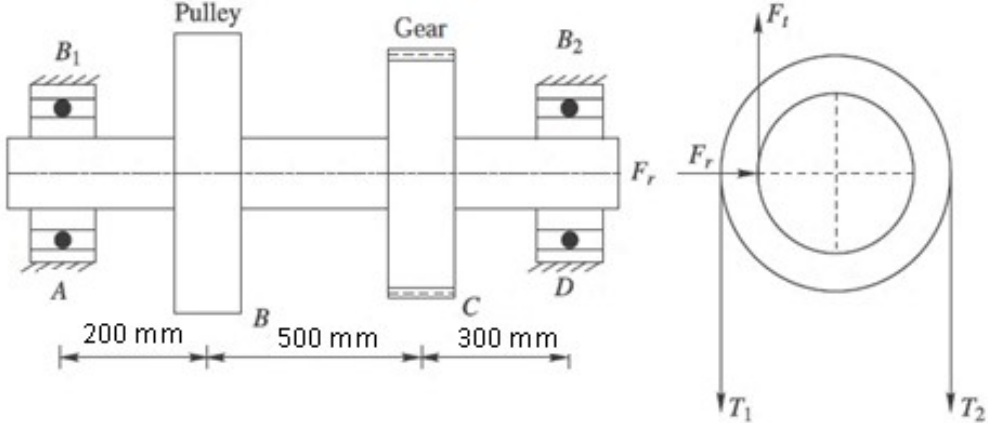
Course : Design of Machine Elements (IPEG325)	Semester: V
Programme : Mechanical / Mechanical- Spl in MSNT/Prod/Thermal / Design	Time: 03 hrs.
Max. Marks : 100	
Total Pages(s): 3	
Instructions : Use of Design Data handbook is allowed. Assume suitable data if required.	

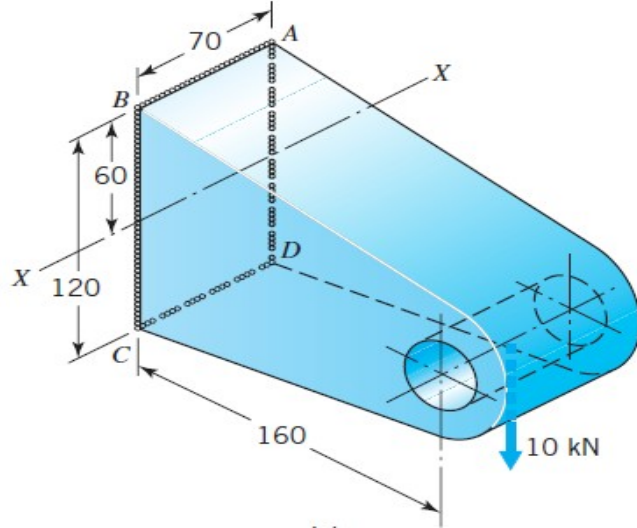
SECTION A

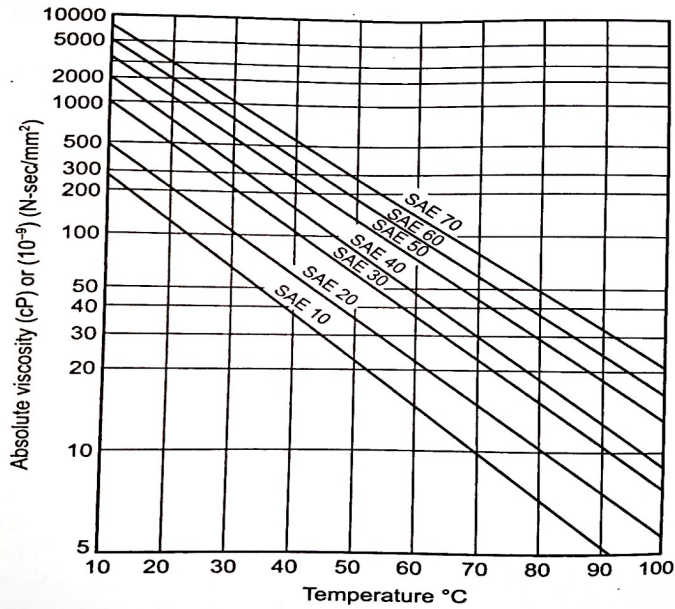
S. No.	Attempt all questions.	Marks	CO
Q 1	Explain the SKF designation of bearing with an example.	5	CO4
Q 2	Classify the gears based upon the following criteria; (i) Axes of Shaft (ii) Speed ratio (iii) Pitch line velocity Support with diagram and application if any.	5	CO4
Q 3	Explain the significance of the Bearing Characteristics no. (ZN/p) used in designing of the journal bearing.	5	CO4
Q 4	Explain with the appropriate reasons (any three) for selection of the ductile materials (C25 to C50) as shaft materials.	5	CO1

SECTION B

There is internal choice in Q. No. 7.

Q 5	<p>A shaft made of steel 40C8 is used to transmit 7.5 kW at 1440 rpm. A pulley mounted on the shaft has a diameter of 0.4 m and ratio of belt tensions is 3.5, as given in figure below. The teeth on gear of 250 mm pitch circle diameter has a 20° involute profile. Assume the equal torque on gear and pulley, design the shaft by using the ASME code.</p> <p>Draw the applicable force diagrams, Bending moment diagrams etc.</p>	20	
		CO4	

Q 6	<p>Determine the weld size required, using maximum shear stress theory, for figure shown below, using E60 welding rod ($S_{yt} = 345 \text{ MPa}$) and a safety factor of 3.</p> 	15	CO3
Q 7	<p>Select an angular contact ball bearing for a radial load of 10000 N and an axial load of 12000 N, operating at a speed of 1200 rpm. For an average life of 4 years at 10 hours per day. Assume uniform and steady load. Suggest the angular contact bearing after assuming the suitable value of angle for angular contact bearing.</p> <p style="text-align: center;">OR</p> <p>Design a journal bearing for a centrifugal pump from the following data: Load on the journal = 20 000 N, Speed of the journal = 900 rpm. Type of oil is SAE 30. Ambient temperature of oil = 15.5°C. Assume the operating temperature in range of 55°C to 75°C. Make the conclusion about the cooling of bearing based upon the calculation.</p>	15	CO4



SECTION-C

There is internal choice in Q. No. 8.

Q 8 It is required to design a pair of spur gear for an exhaust system. The exhaust fan is running at 300 rpm, driven by a motor of 10 KW at 1200 rpm by means of a reduction spur gear. The center distance between fan and motor shaft axes is 300 mm. Design the gear completely in static and dynamic conditions by choosing appropriate material/data from design data handbook.

OR

Two parallel shafts are connected by a pair of steel helical gear. The pinion transmits 20 KW at 1000RPM of the pinion. Both gear and pinion are made of same material. If the velocity ratio is 5:1. Assume the minimum no. of teeth as 30. Consider the appropriate value of helix angle to design the gear assembly. Also, check the gear in wear and suggest the required BHN for designed gear.

30

CO4