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UPES

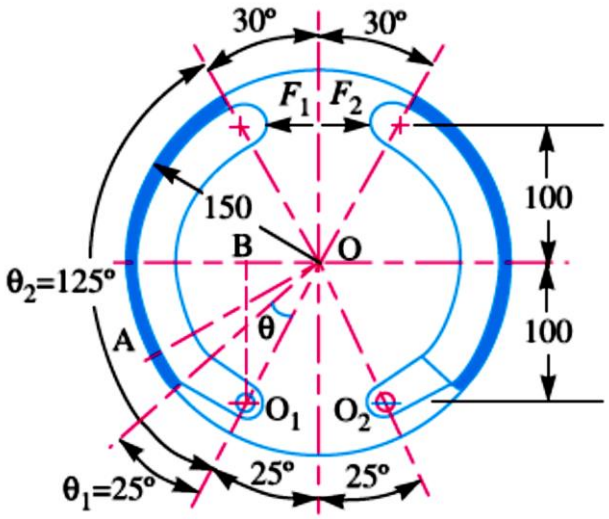
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

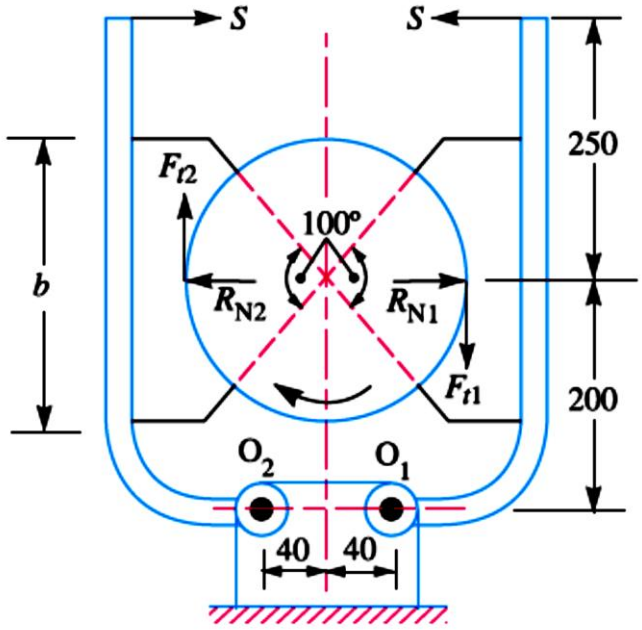
End Semester Examination, May 2018

Programme: B.Tech | **Semester – : II**
Course Name: Machine Design II | **Max. Marks : 100**
Course Code: MHEG 369 | **Duration : 3 Hrs**
No. of page/s:04

Note: Uses of DDHB is allowed during the examination. Assume any data if not provided. Read / understand the problem before solving.

	Marks	CO
Section 'A' (30 Marks)		
1. Explain the bearing characteristics number. Discuss its influence over the coefficient of friction *(f)* and lubrication film thickness with help of diagram.	**6**	**CO2**
2. Explain the uniform pressure theory and uniform wear theory to calculate the frictional torques. Explain the applications of both the theory in clutch design.	**6**	**CO3**
3. Explain the terms related to braking system with examples; (a) Self Energised Braking system (b) Self- locking Braking system	**6**	**CO4**
4. Compare the strength of gear and pinion if both are made with same material. Support with an example.	**6**	**CO5**
5. For bevel gears, define the following: (i) Cone distance; (ii) Pitch angle; (iii) Face angle; (iv) Root angle; (v) Back cone distance;	**6**	**CO5**
Section 'B' (45 Marks)		
6. Design a journal bearing for a centrifugal pump from the following data : Load on the journal = 22 KN; Speed of the journal = 1200 r.p.m.; Type of oil is SAE 10. Ambient temperature of oil = 15.5°C; Maximum bearing pressure for the pump = 1.5 N / mm^2. Also, calculate the mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Consider the Specific heat of oil in range of 1840 to 2100 J/kg/°C. Use the attached chart for selecting the viscosity of lubricating oil. You may assume the other required data.	**15**	**CO2**
7. A plate clutch having a single driving plate with contact surfaces on each side is required to transmit 110 kW at 1250 rpm. The outer diameter of contact surfaces is to be 300 mm. the coefficient of friction is 0.4. (a) Assuming a uniform pressure of 0.17 N/mm^2. Determine the inner diameter of the friction surfaces. (b) Assuming the same dimensions and same total axial thrust, determine the maximum torque that can be transmitted and the maximum intensity of pressure when uniform wear conditions have been reached. **OR**	**15**	**CO3**

7. Give a complete design analysis of a single plate clutch, with both sides effective, of a vehicle to transmit 22 kW at a speed of 2800 r.p.m. allowing for 25% overload. The pressure intensity is not to exceed 0.08 N/mm^2 and the surface speed at the mean radius is not to exceed 2000 m/min. Take coefficient of friction for the surfaces as 0.35 and the outside diameter of the surfaces is to be 1.5 times the inside diameter. The axial thrust is to be provided by 6 springs of about 24 mm coil diameter. For spring material, the safe shear stress is to be limited to 420 MPa and the modulus of rigidity may be taken as 80 kN/mm^2.		
8. Fig. shows the arrangement of two brake shoes which act on the internal surface of a cylindrical brake drum. The braking force F1 and F2 are applied as shown and each shoe pivots on its fulcrum O1 and O2. The width of the brake lining is 35 mm. The intensity of pressure at any point A is 0.4 sin θ N/mm2, where θ is measured as shown from either pivot. The coefficient of friction is 0.4. Determine the braking torque and the magnitude of the forces F1 and F2.  All dimensions in mm. **OR** 8. A double shoe brake, as shown in Fig. is capable of absorbing a torque of 1400 N-m. The diameter of the brake drum is 350 mm and the angle of contact for each shoe is 100°. If the coefficient of friction between the brake drum and lining is 0.4. Determine ; (a) the spring force necessary to set the brake; and (b). the width of the brake shoes, if the bearing pressure on the lining material is not to exceed 0.3 N/mm^2.	**15**	**CO4**



All dimensions in mm.

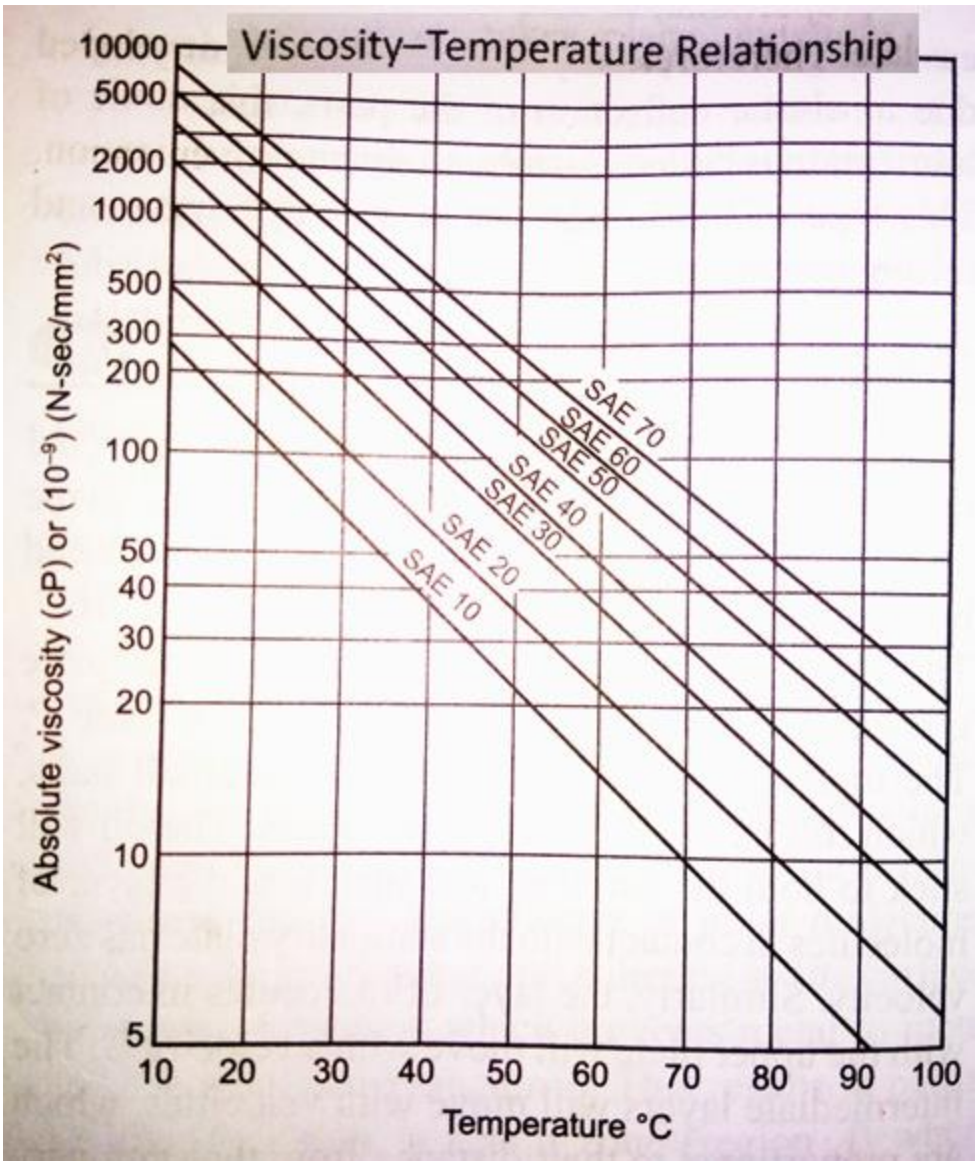
Section 'C' (25 Marks)

Q.No. 9 (attempt any one) | **25** | **CO1**

A compressor running at 300RPM is driven by a 15KW 1200RPM Motor through a 20-degree full depth involute gear. The center distance is 375. Choosing the suitable material for pinion and gear, Design the spur gear drive completely. Assume medium shock condition and other suitable data if any.

OR

Two parallel shafts are connected by a pair of steel helical gear. The pinion transmits 10Kw at 400RPM of the pinion. Both gear made of same material, hardened steel with allowable stress =100MN/ m^2. If the velocity ratio is 4.5:1, determine the smallest diameter gears that may be used having sufficient strength. Not less than 30 teeth are to be used for either gear, the teeth are of 20 degree stub in diametral plane and the helix angle is 23^o.Also check the gear in wear and suggest the required BHN for material used for helical gear.


Viscosity–Temperature Relationship
Absolute viscosity (cP) or (10^{-9}) (N-sec/mm^2)
10000
5000
2000
1000
500
300
200
100
50
40
30
20
10
5
10
20
30
40
50
60
70
80
90
100
Temperature °C
SAE 70
SAE 60
SAE 50
SAE 40
SAE 30
SAE 20
SAE 10