

APJ Abdul Kalam Technological University D

II semester M.Tech Degree Examination May-2016
Branch: Mechanical(Machine Design)
01ME6112 Design of Power Transmission Elements
(2015 Scheme)

Time: 3 hours

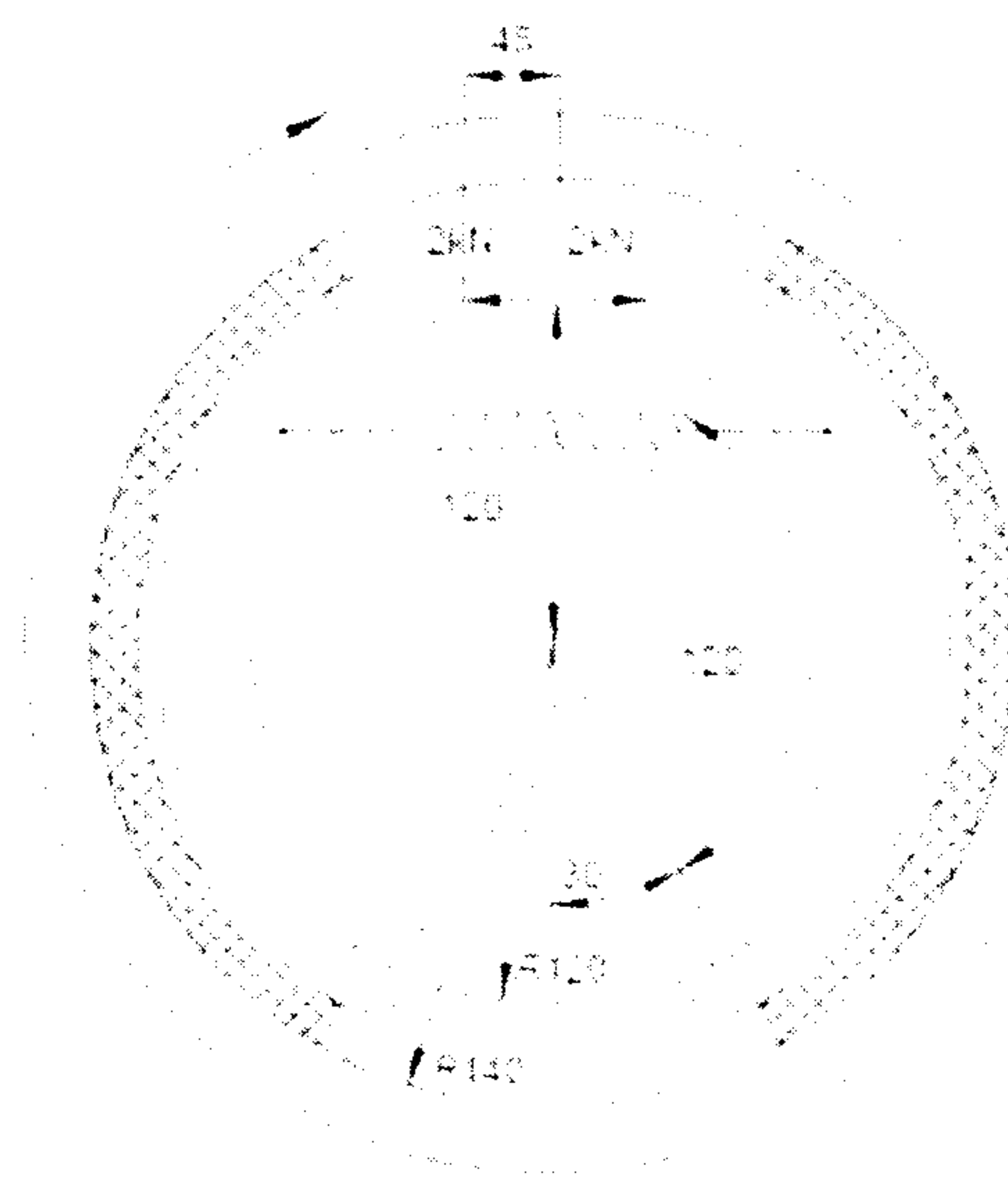
Max Marks: 60

Answer any two questions from each PART.

Use of data book is permitted. Any data not given may be suitably assumed.

PART A

1. Design a flat belt drive for the following data: Drive: AC motor, operating speed is 1440 rpm and operates for over 10 hours. The equipment driven is a compressor, which runs at 900 rpm and the required power transmission is 20 kW. Assume the belt speed as 10m/s. (9)
2. The double internal long shoe drum brake illustrated in Figure has a shoe outer diameter of 280 mm and shoe width of 40mm. Each shoe is actuated by a force of 2kN. The coefficient of friction for the brake lining is 0.25. Find the magnitude of the maximum pressure and the braking torque. (9)



3. (a) What is polygonal effect in chain drive? Explain its effects. (4.5)
- (b) Explain the thermal effects on performance of friction clutches (4.5)

PART B

4. A steel shaft transmitting 25 kW at 200 r.p.m. is supported on two bearings 750 mm apart and has two gears keyed to it. The pinion having 30 teeth of 5 mm module is located 100 mm to the left of the right hand bearing and delivers power horizontally to the right. The gear having 100 teeth of 5 mm module is located 150 mm to the right of the left hand bearing and receives power in a vertical direction from below. Using an allowable stress of 54 MPa in shear, determine the diameter of the shaft. (9)
5. A pair of helical gears are to transmit 15 kW. The teeth are 20° in diametral plane and have a helix angle of 45° . the pinion has an 80mm pitch diameter and operates at 10,000 rpm. The gear has a 320mm pitch diameter. If the gears are made of cast steel $S_{ut} = 200\text{MN/m}^2$, determine a suitable module and face width. The pinion is heat treated to a brinell of 300 and the gear has a brinell hardness of 200. (9)
6. (a) Explain how the design of shaft is performed against fluctuating loads. (4.5)
(b) Write notes on gear tooth failures. (4.5)

PART C

7. A right angle speed reducer uses hardened alloy steel precision cut bevel gears. The transmission ratio is 5 to 1 and the pinion rotates at 900 rev/min while transmitting 40kW. If the teeth are of 20° full depth form and the pinion has a diameter of 115mm, what must be the module and width of the face of the gears, using Lewis equation? $S_{ut} = 400\text{MN/m}^2$ for both gears. What brinell hardness is required for satisfactory wear? (12)
8. Design a 12 speed gear box for a machine with speeds ranging from 200 to 710 rpm. The input speed is 355 rpm. Make a neat sketch of gear box and indicate the number of teeth on all the gears and speeds. For each stage, assume the number of teeth on driver as 20. Ensure standard step ratio. (12)
9. (a) A pair of worm gears is designated as 2/54/10/5. Calculate the centre distance, speed reduction, dimensions of the worm, dimensions of the worm wheel. (6)
(b) What is the need of standard speed ratios and speeds? Explain different standards. (6)