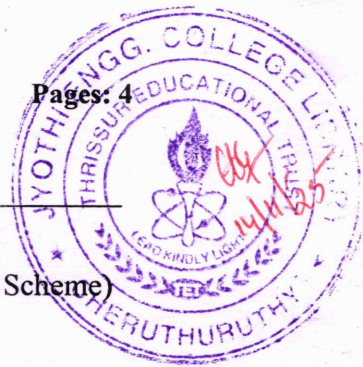


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (R,S) (FT/WP/PT) Examination November 2025 (2019 Scheme)

**Course Code: MET401****Course Name: DESIGN OF MACHINE ELEMENTS****Max. Marks: 100****Duration: 3 Hours****PART A***Answer all questions, each carries 3 marks.***Marks**

- | | | |
|----|--|-----|
| 1 | What is the function of transmission shaft and why it is stepped? | (3) |
| 2 | Explain the concept of slip and creep in belt drives | (3) |
| 3 | Why is the semi-cone angle of a cone clutch made 12.5° ? | (3) |
| 4 | What is internal expanding shoe brake? Where do you use it? | (3) |
| 5 | Define L_{10} life of ball bearing. | (3) |
| 6 | What is hydrodynamic lubrication? | (3) |
| 7 | Explain interference and undercutting in gears | (3) |
| 8 | What is the relationship between actual and virtual no of teeth and the helix angle? | (3) |
| 9 | What is bevel gear and where do you use it? | (3) |
| 10 | Why a worm set is used as jack and hoists for raising loads? | (3) |

PART B*Answer any one full question from each module, each carries 14 marks.***Module I**

- 11 A transmission shaft supporting a helical gear B and an overhung bevel gear D is shown in Fig.1. The shaft is mounted on two bearings. A and C. The pitch circle diameter of the helical gear is 400mm and diameter of bevel gear is at the forces is 400mm. Power is transmitted from the helical gear to the bevel gear. The gears are keyed to the shaft. Select suitable material for the shaft and determine the shaft diameter (14)

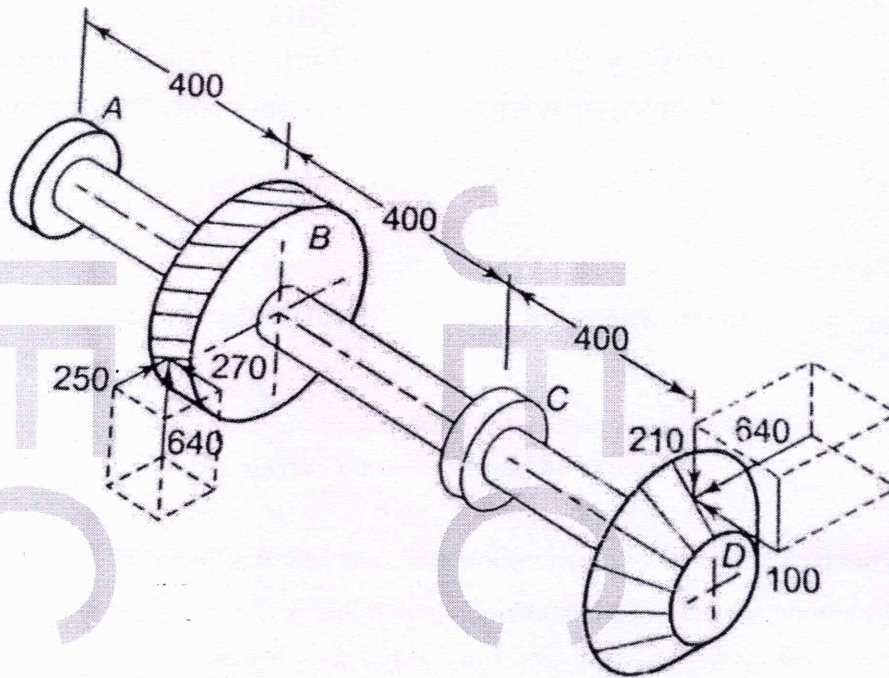


Fig.1

OR

- 12 It is required to select a flat belt drive for a fan running at 360 rpm which is driven (14)
by a 10kW, 1440 rpm motor. The belt drive is open type and space is available for
a centre distance of 2 m approximately. The belt velocity should be between 17.8
to 22.9 m/s. The load correction factor can be taken as 1.2. Suggest preferred
diameters for motor and fan pulleys and give complete specification of belting

Module II

- 13 An automotive type internal expanding double shoe brake is shown in Fig.2. The (14)
face width of the friction lining is 40mm and the maximum intensity of normal
pressure is limited to 1N/mm^2 . The coefficient of friction is 0.32. calculate
- The actuating force P
 - The torque absorbing capacity of the brake.

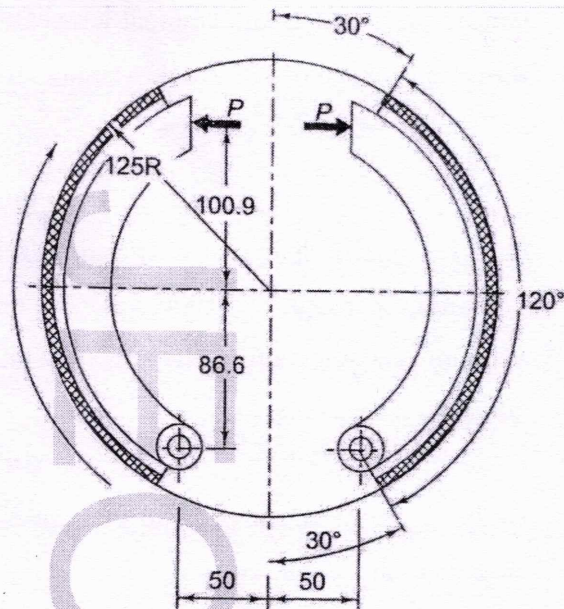


Fig 2

OR

- 14 A single plate clutch having one pair of contacting surfaces to transmit 25 kW at 1000 rpm. The coefficient of friction between contact face is 0.32 and the permissible intensity of pressure should not exceed 1 N/mm^2 . The outer diameter of the clutch is 200 mm. (14)
- Determine the clutch dimensions by assuming uniform wear theory.
 - Calculate the power transmitting capacity of same clutch using uniform pressure theory.
 - Why are clutches usually designed based on uniform wear theory?

Module III

- 15 A single row deep groove ball bearing has a dynamic load capacity of 40500 N and operates on the following work cycle. (14)
- Radial load of 5000N at 500 rpm for 25% of the time
 - Radial load of 10000N at 700 rpm for 50% of the time
 - Radial load of 7000N at 400rpm for the remaining 25% of the time
- Calculate expected life of bearing in hours.

OR

- 16 Design a full journal bearing subjected to 10 kN at 720 rpm. The bearing (14)

temperature is 65°C and ambient temperature is 30°C . The journal diameter is 80 mm and l/d ratio is 1.2. Check whether artificial cooling is required or not.

Module IV

- 17 Design a pair of spur gear to transmit 40 kW power with velocity ratio of 4.2:1. (14)
The pinion is rotating at 1000 rpm. The centre distance between parallel shafts is 120 mm. The allowable static stress for pinion and gear materials is 250 MPa and 200 MPa respectively.

OR

- 18 Design a pair of helical gears to transmit 20 kW at 720 rpm of the pinion. A speed reduction ratio of 4 is required. (14)

Module V

- 19 a) Explain the terminology of bevel gears with a neat sketch. (10)
b) What are the advantages of straight bevel gears over spiral bevel gears (4)

OR

- 20 Design a worm gear drive to transmit 15 kW at 1200 rpm. Speed reduction is 30:1. (14)
The worm is made of hardened steel and the wheel of phosphor bronze.
