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<b>Question Paper Code</b>	<b>14112</b>
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025**

Sixth Semester

**Mechanical Engineering**

**20MEPC601 – DESIGN OF TRANSMISSION SYSTEMS**

Regulations - 2020

(Use of PSG Design Data book is permitted)

Duration: 3 Hours

Max. Marks: 100

**PART - A (MCQ) (10 × 1 = 10 Marks)**

Answer ALL Questions

- |   | <i>Marks</i> | <i>K-<br/>Level</i> | <i>CO</i> |
|---|--------------|---------------------|-----------|
| 1. _____ are used to transmit power between two shafts by means of friction.<br>(a) Belt Drives      (b) Gear Drives      (c) Chain Drives      (d) Rope drives   | 1            | K1                  | CO1       |
| 2. A Wire rope, working factor of safety is given by _____.<br>(a) Breaking load × Effective load.      (b) Breaking load + Effective load.<br>(c) Breaking load - Effective load.      (d) Breaking load / Effective load. | 1            | K1                  | CO1       |
| 3. The minimum number of teeth on the pinion in order to avoid interference for 20° full depth involute system is _____.<br>(a) 12      (b) 14      (c) 18      (d) 32  | 1            | K1                  | CO2       |
| 4. Which of the following increases the fatigue strength of gears?<br>(a) Surface finishing      (b) Shot peening      (c) Heat treatment      (d) Surface coatings   | 1            | K1                  | CO2       |
| 5. Which of the following type of gear tooth failure is caused due to incorrect alignment of gears?<br>(a) Scoring      (b) Pitting      (c) Corrosive wear      (d) Abrasive wear  | 1            | K1                  | CO3       |
| 6. Worm gears are typically used for _____.<br>(a) High-speed applications      (b) Low-speed applications<br>(c) Medium-speed applications      (d) Intermittent applications  | 1            | K1                  | CO3       |
| 7. A ray diagram is used in gear box design to represent _____.<br>(a) Speed ratios      (b) Gear teeth profile      (c) Gear dimensions      (d) Kinematic layout  | 1            | K1                  | CO4       |
| 8. The kinematic layout of a gear box helps in determining _____.<br>(a) Gear ratios      (b) Required speed steps      (c) Gear sizes      (d) Space between gears   | 1            | K1                  | CO4       |
| 9. For a safe design, a friction clutch is designed assuming _____.<br>(a) uniform pressure theory      (b) uniform wear theory<br>(c) varying pressure theory      (d) varying wear theory                                 | 1            | K1                  | CO5       |
| 10. In a self-locking brake, the force required to apply the brake is _____.<br>(a) Minimum      (b) Zero      (c) Maximum      (d) non-zero  | 1            | K1                  | CO6       |

**PART - B (12 × 2 = 24 Marks)**

Answer ALL Questions

- |   |   |    |     |
|---|---|----|-----|
| 11. In what ways, timing belts are superior to ordinary V-belts?          | 2 | K2 | CO1 |
| 12. List the chain drive failures.  | 2 | K1 | CO1 |
| 13. Define the term scoring.  | 2 | K1 | CO2 |
| 14. Differentiate Herringbone gear and double helical gear.               | 2 | K2 | CO2 |
| 15. List the forces acting on bevel gear.                                 | 2 | K1 | CO3 |
| 16. In which gear-drive, self-locking is available?                       | 2 | K1 | CO3 |
| 17. Name the different types of gear boxes.                               | 2 | K1 | CO4 |
| 18. Draw the ray diagram for a six speed gear box.                        | 2 | K2 | CO4 |
| 19. Name four materials used for lining of friction surfaces in clutches. | 2 | K1 | CO5 |

20. Give the applications of centrifugal clutch. 2 K1 CO5
21. List the characteristics of brake lining materials. 2 K1 CO6
22. How does the function of a brake differ from that of a clutch? 2 K2 CO6

**PART - C (6 × 11 = 66 Marks)**

Answer ALL Questions

23. a) Design a V-belt drive for 15 kW, 1440 rpm motor, which drives a centrifugal pump running at a speed of 576 rpm for a service of 8-10 hours per day. The distance between the driver and the driven shaft is approximately 1.2m. 11 K3 CO1

**OR**

- b) Design a chain drive to actuate a compressor from a 10 kW electric motor at 960 rpm. The compressor speed is to be 350 rpm. Minimum centre distance should be 500 mm. Motor is mounted on an auxiliary bed. Compressor is to work for 8 hours/day. 11 K3 CO1

24. a) A Spur Gear Drive is required to transmit 20kW power at 450rpm with a speed reduction ratio of 3. Assume suitable materials. Design the drive. 11 K3 CO2

**OR**

- b) Design a pair helical gear drive to transmit 10 kW at a pinion speed of 1000 rpm of the pinion. Speed ratio is 5. Take 40 Ni2 Cr1 Mo28 Steel as material for pinion and gear. Assume minimum number of teeth as 20 and tabulate the results. 11 K3 CO2

25. a) Design a bevel gear drive to transmit 7.5 kW at 1440 rpm. Gear ratio 3. Pinion and gear are made of forged C 45 steel. Life of gears 10, 000 hours. Assume surface hardened heat treatment and IS quality 6. 11 K3 CO3

**OR**

- b) Design a worm and gear speed reducer to transmit 22 kW at 1440 rpm. The desired velocity ratio is 24:1 and efficiency is 85%. Assume that the worm is made of hardened steel and gear is of phosphor bronze. 11 K3 CO3

26. a) A 9 Speed Gear Box is to give output speeds ranging from 100 rpm to 630 rpm. Draw the Structural Diagram and Kinematic Layout. 11 K3 CO4

**OR**

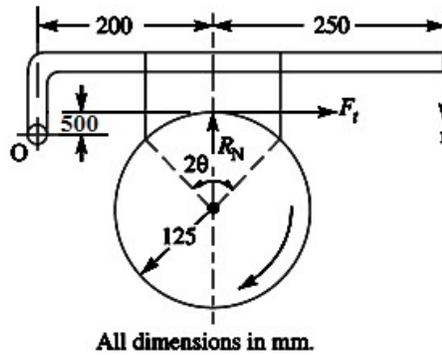
- b) Draw the Speed Diagram and Kinematic Layout of a 12 Speed Gear Box to give speeds in the range of 63 rpm to 2800 rpm. 11 K3 CO4

27. a) A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 r.p.m. Determine the outer and inner diameters of frictional surface if the coefficient of friction is 0.255, ratio of diameters is 1.25 and the maximum pressure is not to exceed 0.1 N/mm<sup>2</sup>. Also, determine the axial thrust to be provided by springs. 11 K3 CO5

**OR**

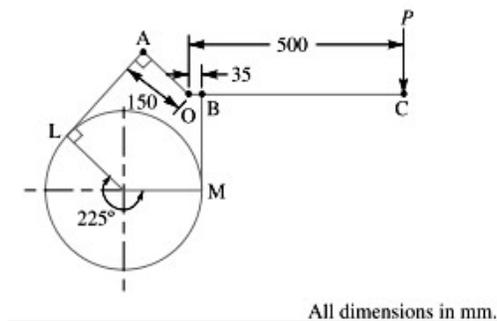
- b) Determine the principal dimensions of a cone clutch faced with leather to transmit 30 kW at 750 r.p.m. from an electric motor to an air compressor. Assume: semi-angle of the cone = 12.5°;  $\mu = 0.2$  ; mean diameter of cone = 6 to 10 d where d is the diameter of shaft; allowable normal pressure for leather and cast iron = 0.075 to 0.1 N/mm<sup>2</sup>; load factor = 1.75 and mean diameter to face width ratio = 6. 11 K3 CO5

28. a) A single block brake, as shown in Figure-1. has the drum diameter 250 mm. The angle of contact is  $90^\circ$  and the coefficient of friction between the drum and the lining is 0.35. If the force of 750N is applied at the end of the lever determine the torque that may be transmitted by the brake. 11 K3 CO6



**Figure-1**  
OR

- b) A differential band brake, as shown in Figure- 2., has an angle of contact of  $225^\circ$ . The band has a compressed woven lining and bears against a cast iron drum of 350 mm diameter. The brake is to sustain a torque of 350 N-m and the coefficient of friction between the band and the drum is 0.3. Find: 1. the necessary force (P) for the clockwise and anticlockwise rotation of the drum; and 2. The value of 'OA' for the brake to be self locking, when the drum rotates clockwise. 11 K3 CO6



**Figure - 2**