



B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2015)

Sixth Semester

MECHANICAL ENGINEERING

U15MET605: Design of Transmission Systems

COURSE OUTCOMES

- CO1:** Choose suitable flexible drive for specific application.
CO2: Design spur and helical gear by considering strength and life
CO3: Estimate the dimensions of bevel and worm gears
CO4: Construct the gear box for suitable application.
CO5: Apply the uniform pressure and wear theories to design the various clutches.
CO6: Design braking system for various applications.

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
PART A (10 x 1 = 10 Marks)**

1. Match the following

CO1 [K₁]

List I	List II
A. Flat belt drive	i. Rubber or polymer
B. V-belt drive	ii. Steels
C. Chain drive	iii. Leather
D. Wire rope	iv. Stainless steel

- | | A | B | C | D |
|----|-----|----|-----|----|
| a) | ii | i | iii | iv |
| b) | iii | iv | ii | i |
| c) | ii | iv | iii | i |
| d) | iii | i | ii | iv |

2. The variation in chain speed is due to-----

CO1 [K₁]

- | | |
|-------------------|-------------|
| a) Chordal action | b) Creep |
| c) slip | d) backlash |

10. In worm and wheel, the shaft axes are at CO3 [K₁]
- a) 90° b) 45°
- c) 180° d) 270°

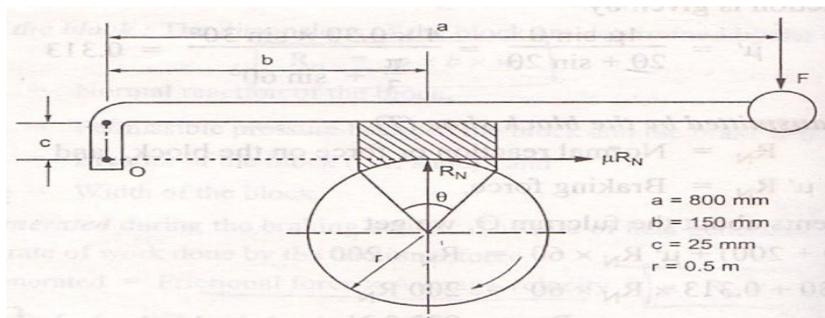
PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. Give the condition for maximum power transmission in terms of centrifugal tension in case of belt drive. CO1 [K₁]
12. Why tight side of the flat belt should be at the bottom side of the pulley? CO1 [K₁]
13. State the law of gearing or conditions of correct gearing. CO2 [K₁]
14. State about herring bone gear. CO2 [K₁]
15. What are the various forces acting on a bevel gear? CO3 [K₁]
16. State the advantage of worm gear drive in weightlifting machine. CO3 [K₁]
17. Which type of gear is used in constant mesh gear box? Justify. CO4 [K₁]
18. Name the series in which speeds are arranged in multi-speed gear boxes. CO5 [K₁]
19. In cone clutches, semi cone angle should be greater than 12°, why? CO6 [K₁]
20. List the characteristics of material used for brake lining? CO5 [K₁]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)
Q.No. 21 is Compulsory

21. Design a V – Belt drive to the following specifications 14 CO1 [K₂]
- Power transmitted = 75 kw
- Speed of driving wheel = 1440 rpm
- Speed of driven wheel = 400 rpm
- Diameter of driving wheel = 300 mm
- Center distance = 2500 mm
- Service = 16 hrs/day
22. The following particulars of a single reduction spur gear are given: 14 CO2 [K₂]
- Gear ratio = 10: 1; Distance between centers = 660 mm approximately; Pinion transmits 500 kW at 1800 r.p.m.; Involute teeth of standard proportions (addendum = m) with pressure angle of 22.5°; Permissible normal pressure between teeth = 175 N per mm of width. Find :
1. The nearest standard module if no interference is to occur
 2. The number of teeth on each wheel

3. The necessary width of the pinion; and
4. The load on the bearings of the wheels due to power transmitted.
23. A pair of bevel gears is to be used to transmit 10 KW from a pinion rotating at 420 r.p.m. to a gear mounted on a shaft which intersects the pinion shaft at an angle of 70°. Assuming that the pinion is to have an outside pitch diameter of 180 mm, a pressure angle of 20°, a face width of 45 mm, and the gear shaft is to rotate at 140 r.p.m., determine (i) the pitch angle for the gears (ii) the forces on the pinion and gear and (iii) the torque produced about the shaft axis 14 CO3 [K₂]
24. A nine-speed gear box, used as a head stock gear box of a turret lathe is to provide a speed range of 180 rpm to 1800 rpm. using standard step ratio, draw the speed diagram, and the kinematic layout. Also find and fix the number of teeth on all gears 14 CO4 [K₂]
25. A automotive single plate clutch consists of two pair of contacting surfaces. The inner and outer radii of friction plate are 120 and 250 mm respectively. The coefficient of friction is 0.25 and the total axial force is 15 KN. Calculate the power transmitting capacity of the clutch plate at 500 r.p.m. using (i) uniform wear theory and (ii) uniform pressure theory. 14 CO5 [K₂]
26. The diameter of the brake drum of a single block shown fig is 1 m .it sustains 240 N-m of torque at 400 r.p.m. the coefficient of friction is 0.32. determine the required force to be applied when the rotation of the drum is (a) clock wise, (b) counter clock wise, and angle of contact (i) 35° (ii) 100° . give that a=800 mm, b=150 mm and c = 25 mm. also find the new value of c for self-locking of the brake. 14 CO6 [K₂]



27. A steel worm running at 240 rpm receives 1.5 kW from its shaft. The speed reduction is 10:1. Design the drive so as to have an efficiency of 80%. Also determine the cooling area required if the temperature rise is restricted to 45°C. Take overall heat transfer coefficient as 10 W/m² °C. 14 CO3 [K₂]
