



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University)
Coimbatore – 641 035.



Reg. No. :

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B.E DEGREE END SEMESTER EXAMINATION, APRIL/MAY 2018
SIXTH SEMESTER
MECHANICAL ENGINEERING
ME309 - DESIGN OF TRANSMISSION SYSTEMS
(Regulations 2013 & 2015)

TIME: THREE HOURS

MAXIMUM MARKS: 100

ANSWER ALL QUESTIONS

PART A -- (10 x 1 = 10 Marks)

- Which drive is not flexible?**
a) Chain drive
b) Belt drive
c) Rope drive
d) Gear drive
- In any chain drive the motion is jerky due to**
a) Elasticity in the drive
b) link friction
c) polygon effect
d) slip
- A spur gear of module 5 and with 20 teeth has a pitch circle radius of**
a) 50 mm
b) 45 mm
c) 100 mm
d) 80 mm
- In helical gears the helix angle may vary in degrees between**
a) 25 and 45
b) 30 and 60
c) 15 and 25
d) 10 and 30
- When bevel gears are used in transmission of power or motion, their shaft axes are**
a) parallel
b) intersecting
c) non-intersecting
d) non-parallel
- Beam strength of worm gears is based on**
a) Buckingham equation
b) Lewis equation
c) Hertz's theory
d) Barth's equations
- The largest speed reduction in an automobile gear box is in**
a) the top gear
b) the first gear

- c) the reverse gear
- d) any of the intermediate gears
- 8. Find the progression ratio for a 12 speed gear box having speeds between 100 and 355 r.p.m.**
- a) 1.415
- b) 1.122
- c) 1.253
- d) 1.2866
- 9. Service factor in clutch design takes care of**
- a) friction heat in the clutch body
- b) torque variations in operation
- c) number of clutch plates
- d) size of the clutch plate
- 10. Basic principle in the operation of a brake is**
- a) power
- b) momentum
- c) thermal energy
- d) friction

PART B -- (10 x 2 = 20 Marks)

- 11. List the various types of belts used for the transmission of power.**
- 12. What do you understand by 6×19 construction in wire ropes?**
- 13. A pair of spur gears with a centre distance of 495 mm is used for a speed reduction of 4.5: 1 The module is 6 mm. calculate the number of teeth on the pinion and gear.**
- 14. How does a helical gear differ from a spur gear?**
- 15. List the applications of bevel gears?**
- 16. Under what situation, worm gears are used?**
- 17. List any two methods used for changing speeds in the gear boxes.**
- 18. Draw the structural diagram (Speed diagram) for a 8-speed gear box with a structural formula $2 \times 2 \times 2$.**
- 19. Differentiate a brake and a clutch.**
- 20. An automotive single plate clutch consists of two pairs of contacting surfaces. The inner and outer radii of friction plate are 120 mm and 250 mm respectively. The coefficient of friction is 0.25 and the total force is 15 kN. Calculate the power transmitting capacity of the clutch plate at 500 r.p.m. using uniform wear theory.**

PART C -- (5 x 14 = 70 Marks)

- 21. (a) Design a fabric belt to transmit 15 kW at 480 r.p.m. from an engine to a 14**

line shaft at 1200 r.p.m. The diameter of engine pulley is 600 mm and centre distance between the pulleys is 2 m.

(OR)

- (b) Design a chain drive to run a compressor from a 11 kW electric motor running at 1000 r.p.m., the compressor speed being 350 r.p.m. The compressor operates 3 shifts a day. The centre distance should be approximately 600 mm. The chain tension can be adjusted by shifting the motor on slides. 14

22. (a) A compressor running at 300 r.p.m. is driven by a 15 kW, 1200 r.p.m. motor through a $14\frac{1}{2}^\circ$ full depth spur gears. The centre distance is 375 mm. The motor pinion is to be of C 30 forged steel hardened and tempered, and the driven gear is to be of cast iron. Assuming medium shock condition, design the gear drive completely. 14

(OR)

- (b) A pair of helical gears subjected to moderate shock loading is to transmit 30 kW at 1500 r.p.m. of the pinion. The speed reduction ratio is 4 and the helix angle is 20° . The service is continuous and the teeth are 20° full depth in the normal plane. For the gear life of 10,000 hours, design the gear drive. 14

23. (a) Design a cast iron bevel gear drive for a pillar drilling machine to transmit 1875 W at 800 r.p.m. to a spindle at 400 r.p.m. The gear is to work for 40 hours per week for 3 years. Pressure angle is 20° 14

(OR)

- (b) Design a worm gear drive to transmit 10 kW at 1440 r.p.m. with a gear ratio of 12. Use steel worm and cast iron wheel. 14

24. (a) Sketch the arrangements of a six speed gear box. The minimum and maximum speeds required are about 460 and 1400 r.p.m. Construct speed diagram of the gear box and obtain various reduction ratios. Use standard output speeds and standard step ratio. Calculate number of teeth in each gear and verify whether the actual output speeds are within $\pm 2\%$ of standard speeds. 14

(OR)

(b) A gear box is to be designed to provide 12 output speeds ranging from 160 to 2000 r.p.m. The input speed of motor is 1600 r.p.m. Choosing a standard speed ratio, construct the speed diagram and kinematic arrangement. 14

25. (a) A multiplate disc clutch transmits 55 kW of power at 1800 r.p.m. Coefficient of friction for the friction surfaces is 0.1. Axial intensity at pressure is not to exceed 160 kN / m². The internal radius is 80 mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque. 14

(OR)

(b) Figure.1 shows the arrangement of two brake shoes which act on the internal surface of a cylindrical brake drum. The braking forces F_1 and F_2 are applied as shown and each shoe pivots on its fulcrum O_1 and O_2 . The width of the brake lining is 35 mm and the intensity of pressure at any point A is $4 \times 10^5 \sin \theta$ N/m², where θ is measured as shown from either pivot. The coefficient of friction is 0.40. Determine the braking torque and the magnitude of the forces F_1 and F_2 14

