QUESTION BANK

AUTOMOTIVE TRANSMISSION

SEMESTER:- 5TH **BRANCH:-** AUTOMOBILE ENGG.

THEORY:- 2

CHAPTERS:

1. Clutch
2. Gear Box
3. Propeller shaft
4. Differential
5. Rear Axle
6. Two wheeler
7. Performance of Automobile

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

TWO MARK QUESTIONS AND ANSWERS

1. State the functions of transmission system.

    i.   It enables the running engine to be connected or disconnected from the driving wheel smoothly.
    ii.   It enables the reduction of engine speeds.
    iii.   It enables the turn of the drive round through 90º.
    iv.   It enables the driving wheel to be driven at different speeds.

2. What is a clutch?

    Clutch is a mechanism used to connect or disconnect the engine from the rest of the transmission elements.

3. List the various parts of a single plate clutch.
    1. Fly wheel
    2. Clutch plate
    3. Pressure plate
    4. Clutch cover assembly
    5. Release mechanism
    6. Withdrawal force and rearing
    7. Primary shaft

4. Why multi-plate clutches are used in automobiles?

    As compared to single plate clutch, these are smoother and easier to operate due to their assembly of friction surfaces contact.

5. Give the two types of multi-plate clutches.
    a. Wet type and b. Dry type

6. How is dog and spline clutch disengaged?

    The sleeve is moved back on the splined shaft to have no contact with the driving shaft.

7. What do you mean by fluid flywheel?

    The member which couples the driving member with driven member through a media of fluid is known as fluid coupling.

8. What is the function of a gearbox?

    Gearbox is a speed and torque changing device.

9. List out the various resistances to motion.

1. Air resistances
2. Gradient resistances
3. Miscellaneous resistances

10. Define tractive effort.

   The torque available on the wheel produces a driving force which is parallel to the road is known as tractive effort.

11. Why is double clutching technique used?

   Even though there is no measure to allow easy measuring of gears, "double clutching" technique must be acquired for shifting gears properly.

12. Write down the methods of operating automatic gearbox.
    1. Hydramatic transmission
    2. Torque converter transmission

13. Name the two types of propeller shafts.
    1. Solid or open type
    2. Hollow or enclosed type

14. Classify universal joints.
    a. Variable velocity joints
    b. Constant velocity joints

15. List down the types of liver rear axles.
    1. Semi-floating
    2. Three-quarter floating
    3. Full-floating

16. How is power developed in automobiles?

   The power is transferred to rear axle through clutch, gearbox, propeller shaft and differential unit.

17. Classify wheels.
    a. Disc wheel
    b. Wire wheel
    c. Split wheel
    d. Light alloy wheel

18. Write down the types of tread patterns in tyres.
    a. Rib pattern
    b. Lug pattern
    c. Rib-and-Lug pattern
    d. Block pattern

19. What is meant by the term 'tread'?

   The tread is an external rubber layer preventing the carcass from wear and external damage which are produced by the road surface.

20. State the important parameters in radial type.
    1. Performance of the tyre
    2. Shape of the tyre

21. Name the various materials used in manufacturing of tyres.
    i. Nylon
    ii. Terylene
    iii. Rubber
    iv. Glass fiber
    v. Steel
22. Write down the basic constituents of a tyre.

    1. Rubber – natural or synthetic
    2. Nylon or Rayon cord fabric
    3. Steel
23. What are the inspecting methods used in tyres?
    1. Visual inspection
    2. Thorough inspection.
24. Describe 154 SR-14 in tyre designation.

    The code 154 SR-14 refers to the tyre having speed rating upto 170kmph of radial tyre and the width of W=154mm with D=14inches.

25. Define tube vulcanization.

    The process of repairing a punctured tube is known as tube vulcanization.

26. What is meant by camel block?
    Fresh tread material is known as 'Camel Block' is placed around the tread and put in retreading machine and clamped.

27. What is wheel balancing?

    Balancing the wheel assemblies correctly to avoid such vibration is known as wheel balancing.

28. Classify wheel balancing.
    1. Static balance
    2. Dynamic balance
29. Classify air suspension system.
    a. Bellow type air suspension
    b. Piston type air suspension
30. State Pascal's law. It states that the total pressure acting on the transmission system is equal to the sum of pressures acting in all directions without any losses.

CHAPTER – 1 : CLUTCH

1. In dice clutch engine flywheel act as a ………
A. Driven plate
B. Driving plate
C. Pressure plate
D. None of above   **Ans – B**

2. Which clutch is also called as flywheel or coupling
A. Fluid clutch
B. Centrifugal clutch
C. Cone clutch
D. Positive clutch   **Ans - B**

3. Which of the following is not types of clutch?
A. Centrifugal clutch
B. Single disc clutch
C. Positive clutch
D. Cylindrical clutch   **Ans - D**

4. Which of the following clutch is positive clutch example
A. Cone clutch
B. Centrifugal clutch
C. Single plate clutch
D. Dog clutch   **Ans - D**

5. Which of the following clutch is friction types clutch example
A. Cone clutch
B. Centrifugal clutch
C. Single plate clutch
D. All of above   **Ans - D**

6. Cone clutch is positive clutch.
A. True
B. False   **Ans - A**

7. Centrifugal clutch is friction types clutch
A. True
B. False   **Ans - A**

8. Jaw clutch is a.......
A. Positive clutch
B. Friction clutch

C. Disc clutch
D. Cone clutch   **Ans - A**

9. Cone clutch is a.......
A. Positive clutch
B. Friction clutch
C. Disc clutch
D. Cone clutch   **Ans - B**

10. In friction clutch high amounts of slip produce than positive clutch.
A. True
B. False   **Ans - A**

11. Centrifugal clutch is a.......
A. Positive clutch
B. Friction clutch
C. Disc clutch
D. Cone clutch   **Ans - B**

12. Clutch used in scooter is......
A. Single plate clutch
B. Multi plate clutch
C. Centrifugal clutch
D. Cone clutch   **Ans – B**

13. Clutch used in truck is......
A. Single plate clutch
B. Multi plate clutch
C. Centrifugal clutch
D. Cone clutch   **Ans – A**

14. For new friction lining .... used
A. Uniform pressure theory
B. Uniform wear theory
C. Both A and B
C. None of these   **Ans - A**

15. In multi plate clutch oil is used for ………
A. To carry away the heat
B. To reduce friction
C. Lubricating the surface
D. All of above   **Ans - D**

16. In tractors generally used multi plate clutch.
A. True
B. False   **Ans - B**

17. Multi plate clutch is compact construction than single plate clutch so multi stage clutch used in scooter.
A. True
B. False   **Ans - A**

18. If contacting surface is 6 then number of disc used in multi plate clutch is.........
A. 5
B. 6
C. 7
D. 8   **Ans - C**

19. Multiple plate clutch is required small size compared to single plate clutch for same torque transmission.
A. True
B. False   **Ans - A**

20. In positive clutch .... slip
A. High
B. Low
C. Zero
D. None of these   **Ans - C**

21. The clutch used in tractors is ....
A. Singleplate clutch
B. Multi plate clutch
C. Any one
D. None of these   **Ans - A**

22. clutch and coupling perform the same action .
A. True
B. False   **Ans - B**

CHAPTER -2 : GEAR BOX

1. Which of the following is the need of the gearbox?
a) To vary the speed of the vehicle
b) To vary the torque of the vehicle
c) To vary the power of the vehicle
d) To vary the acceleration of the vehicle   **Answer: b**
Explanation: The purpose of the gearbox is to give means so that the torque can be varied as required between the engine and the road wheels.

2. In which type of manual transmission the double-declutching is used?
a) Constant-mesh gearbox
b) Sliding mesh gearbox
c) Synchromesh gearbox
d) Epicyclical gearbox   **Answer: a**
Explanation: The double-declutching is used in the constant-mesh gearbox. For the smooth engagement of the dog clutch, the speed of the main shaft and layshaft should be the same.

3. In which of the gearbox all gears are always in contact?
a) Constant-mesh gearbox
b) Sliding mesh gearbox
c) Synchromesh gearbox
d) Epicyclical gearbox   **Answer: a**
Explanation: In constant mesh gearbox, all gears on the layshaft and main shaft are in contact all the time. For selecting gear, the dog clutch is used.

4. In which of the gearbox sun and planet gear set is used?
a) Constant-mesh gearbox
b) Sliding mesh gearbox
c) Synchromesh gearbox
d) Epicyclical gearbox   **Answer: d**
Explanation: In epicyclic gearbox, the sun and planet gears are used. Using this arrangement various gear ratios can be obtained. Also, this type of gearbox is compact in design than other types of gearbox.

5. Where is the overdrive located?
a) Between transmission and engine
b) Between transmission and rear axle
c) Between transmission and propeller shaft
d) Between transmission and differential   **Answer: c**
Explanation: The overdrive is used to increase the gear ratio of the vehicle. It used where the high speed is needed at relatively low engine speed. By using overdrive, the wear of the engine parts is less and decreases the vibration and noise.

6. Which of the following is not part of automatic transmission?
a) Epicyclic gearbox
b) Torque convertor
c) Multi-plate clutch
d) Sliding mesh gearbox   **Answer: d**

Explanation: The automatic transmission consists of the epicyclic gearbox, torque convertor, and multi-plate clutch. The sliding mesh gearbox is a type of manual transmission.

7. In which of the configuration of epicyclic gearbox output will be forward and fast output speed?
a) Sun gear stationary, ring gear driven, planet carrier driving
b) Sun gear driving, ring gear driven, planet carrier stationary
c) Sun gear driven, ring gear stationary, planet carrier driving
d) Sun gear stationary, ring gear stationary, planet carrier driving   **Answer: a**
Explanation: When the Sun gear is stationary, the planet carrier is driving and the ring gear is driven then output is forward and fast speed. When any two of the three are stationary then we get the direct drive.

8. Which types of gears are used in constant mesh gearbox?
a) Spur gear
b) Helical gear
c) Bevel gear
d) Worm gear   **Answer: b**
Explanation: As the gears are always in mesh in the constant-mesh gearbox, therefore there is no need for using the spur gears and the helical gears are used as those are quite in use.

9. Why are the helical gears used commonly in transmission over spur gears?
a) Low cost and high strength
b) Low noise level and high strength
c) Low noise level and economy
d) Low noise level and low cost   **Answer: b**
Explanation: The teeth profile on the helical gear is at an angle to the axis of the gear because of which helical gears produce less noise during operation and also they have high strength.

10. Increase of torque in a vehicle is obtained by decreasing power.
a) True
b) False   **Answer: b**
Explanation: Increase of torque in a vehicle is obtained by decreasing speed. As we know $P = 2\pi NT/60$ for the same power (P), T (torque) is inversely proportional to N (speed).

CHAPTER – 3 ,4 PROPELLER SHAFT , UNIVERSAL JOINT , DIFFERENTIAL

1. Which types of joints are used when the shafts are inclined?
a) Universal joint
b) Hinge joint
c) Ball and socket joint
d) Pivot joint   **Answer: a**
Explanation: Universal joint is used when the shafts are inclined and intersecting. It is very compact in design and simple in construction. It is very effective at small angles of propeller shaft movement.

2. The axes of the two shafts are intersecting and are at 25° to each other. These two shafts are connected by Hook's joint. At which position of the drives shaft velocity ratio will be maximum?
a) 90°, 270°
b) 0°, 180°
c) 180°, 270°
d) 90°, 180°   **Answer: b**
Explanation: $(\omega_B / \omega_A) = (\cos \alpha) / (1 - \cos^2\theta \sin^2\alpha)$ where A = driving shaft and B = driven shaft and α is the angle between shaft A and shaft B. θ is the angle through which the shaft A rotates. Velocity ratio is maximum when $\theta = n\pi$ where n = 1, 2, 3, …… i.e. θ = 0° or 180°.

3. Which of the following is the disadvantage of the open differential?
a) High in cost
b) Not reliable
c) Complex design
d) Sends most of the power to the wheel having less traction   **Answer: d**
Explanation: The major disadvantage of the open differential in that it transfers the power to the wheel even if it is on a slippery road. That's why it is not used in off driving cars.

4. Why do the hypoid gears require special lubricant?
a) Teeth are soft
b) Teeth are hard
c) Gears run faster
d) There is relative motion between teeth   **Answer: d**
Explanation: Hypoid gears require special lubricant because of the extreme pressure between the teeth. The sliding motion of the teeth is effective due to the use of special lubricant.

5. The axes of the two shafts are intersecting and are at 30° to each other. These two shafts are connected by Hook's joint. At which position of the drives shaft velocity ratio will be minimum?
a) 90°, 270°
b) 0°, 180°
c) 180°, 270°
d) 90°, 180°   **Answer: a**
Explanation: $(\omega_B / \omega_A) = (\cos \alpha) / (1 - \cos^2\theta \sin^2\alpha)$ where A = driving shaft and B = driven shaft and α is the angle between shaft A and shaft B. θ is the angle through which the shaft A rotates. Velocity ratio is minimum when $\theta = m\&pi/2$ where m = 1, 3, 5, …… i.e. θ = 90° or 270°.

6. Where is the differential located?
a) Between transmission and rear axle

b) Between engine and transmission
c) Between two propeller shaft
d) Between steering wheel and steering column **Answer: a**
Explanation: The differential used to incorporate the speed of the rear wheels and front wheels during turning. It is located between the transmission and rear axle.

7. The axes of the two shafts are intersecting and are at 35° to each other. These two shafts are connected by Hook's joint. At which position of the drives shaft velocity ratio will not be unity?
a) 42.145°
b) 222.145°
c) 317.85°
d) 141.52° **Answer: d**
Explanation: $(\omega_B / \omega_A) = (\cos \alpha) / (1 - \cos^2\theta \sin^2\alpha)$ where A = driving shaft and B = driven shaft and α is the angle between shaft A and shaft B. θ is the angle through which the shaft A rotates. Velocity ratio is unity when $\tan\theta = \pm \cos\alpha$ ---- $\sqrt{} = \pm\cos35$ ----- $\sqrt{} = \pm 0.90$ i.e. $\theta = 42.145°, 222.145°, 317.85°$, and 137.85°.

8. What is the need of the universal joint?
a) To change inclination
b) To bend sideways
c) To transfer torque at an angle
d) To change length **Answer: c**
Explanation: The universal joint transfers the torque to two intersecting shafts. One or two universal joints are used depending upon the type of rear-drive used.

9. The axes of the two shafts are intersecting and are at 35° to each other. These two shafts are connected by Hook's joint. At which position of the drives shaft acceleration will be maximum?
a) 68.4°
b) 96.1°
c) 225.5°
d) 330.7° **Answer: c**
Explanation: $(\omega_B / \omega_A) = (\cos \alpha) / (1 - \cos^2\theta \sin^2\alpha)$ where A = driving shaft and B = driven shaft and α is the angle between shaft A and shaft B. θ is the angle through which the shaft A rotates. Acceleration will be maximum when $\cos2\theta = (2 \sin^2\alpha) / (2 - \sin^2\alpha) = (2 \sin^240°) / (2 - \sin^240°) = 0.5207$ i.e. $2\theta = 58.62$ i.e. $\theta = 29.31°, 180° - 29.31° = 150.69°, 180° + 29.31° = 209.31°, 360° - 29.31° = 330.69°$

10. A two-piece propeller shaft requires one universal joint.
a) True
b) False **Answer: b**
Explanation: A two-piece propeller shaft requires a center support bearing. If there is a large wheelbase, the long propeller shaft is needed. So a two-piece propeller shaft is used in such case with a center support bearing. By incorporating this there is no sag or whirl.

CHAPTER – 5 : REAR AXLE

1. The type of rear axle in which the wheel end is supported by bearings inside the axle housing is

A. Semi floating axle

B. Three-quarter floating axle

C. Full-floating axle

Answer : **A**

2. The two basic types of axle are

A. Dead and floating

B. Dead and live

C. Floating and semi floating

Add to Fav | Answer : **B**

3. Axle shaft of the three-quarter floating axle is subjected to

A. Bending stress only

B. Torsional stress only

C. Bending and torsional stress

D. Torsional stress and stress due to axial force during cornering

Add to Fav | Answer : **B**

4. In a vehicle with dual rear axle, the wheel base is measured from the

A. Axis of the front wheel to the nearest rear wheel axis

B. Axis of the front wheel to the farthest rear wheel axis

C. Rear of cab to farthest rear wheel axis

D. Axis of the front wheel to an axis midway between the axes of rear wheels

Answer : **C**

5. The axle shaft of a semi floating rear axle is subjected to

A. Axial thrust only

B. Axial thrust and bending stress

C. Torsional stress only

D. Bending, torsional stresses and end thrust

Answer : **D**

6. Differential mechanism at the axle is provided mainly to

A. Enable the vehicle go round corners

B. Equalize the division of torque between the two wheels c. To provide a reduction ratio

C. To turn the drive through a right angle

Answer : **A**

7. De Dion axle is usually

A. Used at the front of heavy vehicles

B. A kind of axle in which the differential and final drive gears are supported in the frame

C. A two speed axle drive suited for heavy vehicles

D. The popular drive for 2 wheeler

Answer : **B**

8. Floating axles are classified on the basis of

A. The amount of torque transmitted

B. Depending upon their location whether at front or rear

C. Depending on the nature of forces like torsional vertical and lateral to which they are subjected

D. Purely on the basis of type and number of bearings used at the work

Answer : **C**

9. Which of the following layouts is not used in motor vehicles?

A. Front engine front drive

B. Front engine rear drive

C. Rear engine front drive

D. Rear engine rear drive

Add to Fav Answer : **C**

10. The most popular drive at the drive axle for the passenger car is

A. Straight bevel gear

B. Spiral bevel gear

C. Worm gear drive

D. Hypoid drive

Add to Fav Answer : **D**

CHAPTER – 7 : PERFORMANCE OF AUTOMOBILE

1. What is the power delivered by the engine to the crankshaft called?

a) Shaft power b) Horse power c) Brake power d) None of the mentioned

Answer: c

Clarification: The total power delivered by the engine to the crankshaft is called Brake power. It can also be defined as the difference between indicated power and friction power.

2. If 'T' is torque(in Nm) and 'N' is speed(in rpm) then the required expression for Brake power 'B.P' in kWs is _____

a) $2\pi NT/6000$ b) $2\pi NT/60000$ c) $\pi NT/6000$ d) $\pi NT/60000$

Answer: b

Clarification: The required expression is B.P = $2\pi NT/60000$.

3. The torque available at the contact between road and driving wheel is called _____

a) Brake power b) Friction power c) Tractive effort d) Engine torque

Answer: c

Clarification: The torque between road and wheel is called tractive effort. Tractive effort is used to describe the pulling capability of an automobile. The tractive force is inversely proportional to the velocity of the vehicle.

4. If 'V' is vehicle speed(in metres/min) and 'R' is radius of driving wheel(in metres) then the rpm of the driving wheel is given by _____

a) rpm = $V/2\pi R$ b) rpm = $2\pi V/R$ c) rpm = $\pi R/V$ d) rpm = $\pi V/R$

Answer: a

Clarification: The rpm of the driving wheel can be expressed as rpm = $V/2\pi R$.

5. Which of these is not a power loss which takes place between engine and driving wheel?

a) Power loss due to friction of piston bearings and gears b) Power loss from clutch to drive wheel due to friction of various parts c) Transmission line loss d) None of the mentioned

Answer: d

Clarification: All the above mentioned losses are encountered while transmission of power. About one third of the power of the fuel is wasted due to the friction between different parts of an automobile. This loss can be reduced by using different engine oils.

6. The force that opposes the motion of a vehicle is _____

a) Rolling resistance b) Gradient resistance c) Wind or air resistance d) All of the mentioned

Answer: d

Clarification: Rolling resistance, gradient resistance and air resistance all oppose the motion of a vehicle.

7. Rolling resistance doesnot depend on which of the following factors?

a) Load on each road wheel b) Radius of driving wheel c) Wheel inflation pressure d) Nature of road surface

Answer: b

Clarification: Rolling resistance does not depend on radius of driving wheel.

8. For an average type of road surface what percentage of vehicle's weight constitutes rolling resistance?

a) 5 to 10% b) 1 to 2% c) 2 to 5% d) 0 to 3%

Answer: b

Clarification: On an average road surface rolling resistance is 1 to 2% of vehicle's weight.

9. Wind or air resistance depends on which of the following factors?

a) Shape and size of vehicle body b) Air velocity c) Speed of vehicle d) All of the mentioned

Answer: d

Clarification: Air resistance on a vehicle depends on all the above mentioned factors.

10. If 'k' is coefficient of air resistance, 'A' is frontal area projected by the vehicle in square metres and 'V' is vehicle speed(in km/h) then the expession for air resistance 'A.R' on the vehicle is _____

a) A.R = k*A*V^2 b) A.R = k*A*V^3 c) A.R = 2k*A*V d) A.R = k*A*V

Answer: a

Clarification: The correct expression for air resistance is A.R = k*A*V .

11. The value of coefficient of air resistance for average cars is approximately equal to _____

a) 0.32 b) 0.032 c) 0.0032 d) 1.32

Answer: c

Clarification: For average cars, value of coefficient of air resistance is approx 0.0032.

12. One Horse Power(H.P) is approximately equal to _____ Watts.

 a) 810 b) 545 c) 634 d) 746

Answer: d

Clarification: 1 H.P = 746 Watts.

13. Gradient resistance for a vehicle depends on which of the following factors?

a) Weight of the vehicle b) Size of the vehicle c) Width of tyres d) Speed of the vehicle

Answer: a

Clarification: Gradient resistance depends on weight of the vehicle.

14. Power to weight ratio for high performance cars can range up to _____

a) 150 b) 190 c) 230 d) 280

Answer: c

Clarification: The ratio of power to weight of high performance cars can range as high as 230.

THANK YOU