UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
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Programme Name: B. Tech ADE   **Semester   : VI**
Course Name   : Automotive Chassis Components Design   **Time   : 02 hrs**
Course Code   : MEAD-3003   **Max. Marks: 100**
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Section A

1. **The torque available at the contact between driving wheels and road is known as**
   A. brake effort
   B. Tractive Effort
   C. clutch effort
   D. none of these

2. **The ball joints are used on the tie rod ends, because they**
   A. Reduce the amount of noise generated
   B. Reduce the amount of sliding resistance
   C. Can deal with movement of the suspension both vertically and in other directions
   D. Improve the force transmission speed

3. **Which of the following factors is not related to the effect of independent front suspension**
   a. Reducing the unsprung masses
   b. Reducing tyre wear
   d. **Elimination of gyroscopic couples**

4. **Helper springs are usually used**
   a. **In heavy vehicles in suspension system to obtain a two stage spring rate**
   b. In vehicles to improve the load capacity of suspension system
   C. To stiffen the suspension

d. None of these

5. The torque developed by a disc clutch is given by

   (a) T = 0.25 μ.W.R (b) **T = 0.5 μ.W.R**

   (c) T = 0.75 μ.W.R (d) T = μ.W.R

6. In case of a multiple disc clutch, if n1 are the number of discs on the driving shaft and n2 are the number of the discs on the driven shaft, then the number of pairs of contact surfaces will be

   (a) n1 + n2 (b) **n1 + n2 − 1**

   (c) n1 + n2 + 1 (d) none of these

7. Rear-wheel-steering is used where high manoeuvrability is a necessity on a low-speed vehicle.

   a. **True**

   b. False

8. Rear-wheel-steering is not used on street vehicles because it is unstable at high speeds.

   a. **True**

   b. False

9. The center of rotation for a rear-wheel-steering vehicle is always a point on the front axle.

   a. **True**

   b. False

10. Consider a vehicle with wheel base 2.619 m, wheel track 1.565 m, distance between CG and rear axle 1.524m, inner steering angle 12 ° (degree). Calculate the outer steering angle in radian.

    a. 1.86

    b. **0.186**

    c. 0.286

    d. 10.66

11. Consider the engine is producing 1320 kJ/min of energy @ 1800 rpm and its bottom gear ratio is 3.4. if a propeller shaft of 35 mm diameter is to be used, determine the torque transmitted by the shaft in N-m made of mild steel tube to be used by assuming a safe shear stress 55 x 10^3 kPa for MS

    a. **397.00**

b. 297.00

c. 0.397

d. 0.297

12. Steel made propeller shaft (hollow) of a vehicle is capable of transmitting a torque of 0.55 kN-m with its external diameter 50 mm calculate its inner diameter (mm). If necessary, take safe shear stress 55×10^3 kPa.

a. 40

b. 50

c. 35

d. 45

13. Consider the following data for the helical spring

Mean diameter of spring = 200 mm

Diameter of steel wire, used for making the spring = 40 mm

What will be the Wahl's stress factor?

a. 1.31

b. 2.31

c. 0.31

d. 4.31

14. The helix angle is very small about 2^0. The spring is open coiled spring.

a) Yes

b) **It is closed coiled spring**

c) That small angle isn't possible

d) None of the listed

15. The spring index is the ratio of wire diameter to mean coil diameter.

a) **True**

b) False

16. If spring index=2.5, what can be concluded about stresses in the wire?

a) **It is high**

b) It is negligible

c) It is moderate

d) Cannot be determined

17. A spring with index=15 is prone to buckling.

a) **True**

b) False

18. If the spring is compressed completely and the adjacent coils touch each other,the the length of spring is called as?

a) **Solid length**

b) Compressed length

c) Free length

d) None of the mentioned

19. If number of coils are 8 and wire diameter of spring 3mm, then solid length is given by?

a) None of the listed

b) 27mm

c) **24mm**

d) 21mm

20. Compressed length is smaller than the solid length.

a) True

b) **False**

21. Pitch of coil is defined as axial distance in compressed state of the coil.

a) Yes

b) **It is measured in uncompressed state**

c) It is same in uncompressed or compressed state

d) None of the listed

22. The material used for lining of friction surfaces of a clutch should have .... coefficient of friction. **(high)**

23. In the friction clutch, Slip occurs only during engaging operation once it engaged, there is no slip.

a. **True**

b. False

24. Differential gear box in a vehicle allows drive wheels to turn at different speed (rpm) by receiving different power from engine.

a. True

b. **False**

25. Main failure in the propeller shaft due to maximum twisting moment occurs because of excessive shear stress.

a. **True**

b. False

Section B

1. A vehicle having a gross mass of 2000 kg and a wheelbase of 2.44 m, track width of the vehicle is 70 % of the wheelbase. Weight is equally distributed on each wheel when all the tires are on plain ground. The car center of gravity lies1.52 m from the rear axle. The front end of the vehicle is lifted 40 cm and gives a mass reading of 1150 kg. The wheel radius is 30.5 cm. Determine the position of the CG.

2. A plate clutch having a single driving plate with contact surfaces on each sides required to transmit 110 kW at 1250 r.p.m. The outer diameter of the contact surfaces is to be 300 mm. The coefficient of friction is 0.4.

a. Assuming a uniform pressure of 0.17 N/mm2; determine the inner diameter of the friction surfaces.

b. Assuming the same dimensions and the same total axial thrust, determine the maximum torque that can be transmitted and the maximum intensity of pressure when uniform wear conditions have been reached.

3. Design a compression helical spring to carry a load of 500 N with a deflection of 25 mm. The spring index may be taken as 8. Assume the following values for the spring material: Permissible shear stress = 350 MPa, Modulus of rigidity = 84 kN/mm^2

4. A semi-elliptical laminated spring is to carry a load of 5 KN. It consists of 10 leaves 50 mm wide, 2 of the leaves being of full length. The spring is to be 1 m between the eyes and is held at centre by 53 mm wide clamp. Assume that the spring is initially stressed so as to induce an equal stress of 500 N/mm^2 when fully loaded. Determine the dimensions of spring giving (i) thickness of leaves, (ii) eye dimensions, (iii) length of leaves, and (iv) maximum deflection and chamber. Take E =200 GPa,

5. (a) A hollow propeller shaft of an automobile has 100 mm outside diameter and 70 mm inside diameter. The length of the shaft between the universal joints is 1.5 m and it transmits a torque 200 N-m. The maximum axial propeller thrust is 1 KN and the density of shaft material is 7.8 gm/cm^3. Determine the maximum shear stress developed in the shaft. Consider the bending due to self-weight. (10)

(b) Explain the design details of the semi-floating and full floating axle. Also, give details of axle housing. (5)