

**B.E DEGREE EXAMINATIONS: NOV/DEC 2014**

(Regulation 2009)

Fourth Semester

**AUTOMOBILE ENGINEERING**

AUE105: Automotive Chassis

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

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

1. Weight of the vehicle produces in the side member of the frame
  - a) vertical bending
  - b) horizontal bending
  - c) torsion
  - d) lozenging
2. One purpose of a recirculating ball type steering gear is to reduce the
  - a) operating friction
  - b) operating cost
  - c) toe-out during turns
  - d) number of parts
3. The function of a universal joint is to allow the propeller shaft to
  - a) change length
  - b) bend sideways
  - c) transfer torque at an angle
  - d) change inclination
4. The inner end of the axle shaft is splined to the
  - a) sun gear
  - b) planet pinion
  - c) crown wheel
  - d) differential cage
5. When the rear wheels are jacked up and gears in neutral, turning one rear wheel forward in a rear drive vehicle cause the other wheel to
  - a) turn backward
  - b) turn forward
  - c) turn in either direction
  - d) remain stationary
6. The adjustment of the backlash in a differential is provided between
  - a) crown wheel and the sun gear
  - b) sun gear and the planet gear
  - c) crown wheel and the drive pinion
  - d) crown wheel and the planet gear
7. The function of a shackle with a leaf spring to
  - a) allow pivoting of spring end
  - b) allow spring length to change
  - c) control sideways
  - d) control rear torque

8. Maximum room in the engine compartment is provided with
- |                             |                                 |
|-----------------------------|---------------------------------|
| a) Wishbone type suspension | b) Mac Pherson strut suspension |
| c) rigid axle suspension    | d) vertical guide suspension    |
9. The brake bleeding process removes from systems
- |                 |                    |
|-----------------|--------------------|
| a) air          | b) vacuum          |
| c) excess fluid | d) excess pressure |
10. Due to weight transfer, the ratio of the braking effect at the front and at the rear wheels should be
- |                                 |                                  |
|---------------------------------|----------------------------------|
| a) 50% at front and 50% at rear | b) 60% at front and 40 % at rear |
| c) 40% at front and 60% at rear | d) 70% at rear and 30 % at front |

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

11. Why ladder type frame chassis preferred in commercial vehicles? Also enumerate the merits of location of rear engine and rear wheel drive.
12. Contrast caster and camber. Furthermore mention the parameters involved in steering alignment.
13. List down the functional requirement of propeller shaft.
14. Mention the method of achieving the differential lock. Also state the need for differential lock.
15. Why trucks and busses are employed with fully floating axles? Also with free body diagram sketch the forces acting on them.
16. On a sports utility vehicle's tyre side wall is printed with 205/85 R17. With a sketch what do you infer from the given specification?
17. Greater part of the passenger cars are fitted with Mac Pherson strut type suspension. Justify.
18. A typical coil suspension spring has 10 effective coils and mean diameter 125 mm and made out of wires diameter 15 mm. the spring is designed to carry a maximum static load of 3231 N. compute the deflection when the spring material modulus of rigidity is given as  $73575 \times 10^3$  kPa.
19. A vehicle weighs 8000 N is travelling at 40 km/hr. Estimate its kinetic energy possesses and with the braking force of 2.5 kN what will be the stopping distance?
20. Heavy duty vehicles are employed with air brake system. Justify.

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

21. a) Illustrate the constructional details of monocoque chassis with a neat sketch. Also brief about the horizontal lozengeing and vertical bending of a typical ladder frame chassis.

**(OR)**

- b) (i) An estate wagon has a wheel base of 2745 mm and pivot centre location of 1065 (7)

mm. The front and the rear wheel track is 1220 mm. Estimate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheels when the angle of inside lock is  $40^{\circ}$ .

(ii) Describe in detail to achieve condition for true rolling of a vehicle. (7)

22. a) With neat sketch demonstrate Hotchkiss open-type drive. Also explain the forces acting on them with a free body diagram.

**(OR)**

b) (i) A light goods vehicle (LGV) engine delivers a power of 51 kW @ 2100 rpm and its bottom gear ratio is 3.5. If the propeller shaft of 45 mm outside diameter is to be used, compute the inside diameter of mild steel tube to be used, by assuming a safe shear stress of  $60 \times 10^3$  kPa for the mild steel. (10)

(ii) Write short notes on Hook and cross-type joints (4)

23. a) Explain the weight distribution and power transmission of a fully and three quarter floating axle-hub. Also with schematic write down the expression with for shear stress for the axle shaft.

**(OR)**

b) With a neat schematic illustrate the construction details of cross and radial ply tyres. Mention the significance of accumulation of counter weights between tyre and rim during the wheel balancing.

24. a) A vehicle spring of semi-elliptic type has leaves of 75 mm width and 10 mm thickness and effective length 900 mm. if the stress is not exceed 220725 kPa when the spring is loaded to 4905 N, estimate the required number of leaves and deflection under this condition. If the spring is just flat under load, what is initial radius? Take  $E = 196.2 \times 10^6$  kPa

**(OR)**

b) (i) Demonstrate with neat sketch of telescopic damper. (7)

- (ii) Mention the purpose of the independent suspension. Also explain various (7) methods to achieve the same in front and rear axles of cars.

25. a) Derive the forces acting on the vehicle during braking while moving down on an inclined path. When

- (i) Brakes applied to the rear wheels.
- (ii) Brakes applied to the front wheels.

**(OR)**

- b) (i) Illustrate with layout of hydraulic line brake system. (7)
- (ii) Mention the need for brake booster and slack adjuster in drum brake system for heavy commercial vehicle braking systems. (7)

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