

**B. TECH.**  
**(SEM.VII) THEORY EXAMINATION 2018-19**  
**AUTOMOBILE ENGINEERING**

Time: 3 Hours

Total Marks: 100

- Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.  
2. Be precise in your answer. Draw neat diagrams wherever necessary.

**SECTION A**

1. **Attempt all questions in brief.** **2 x 10 = 20**
- Define "Automobile" and classify Auto- vehicles from different aspects.
  - Write important events from history of an Automobile.
  - Explain the reason that why big tyres are used in rear of vehicles.
  - What are the various defects in clutch?
  - "Stability and safety in a modern car is greatly improved" comment on the statement.
  - What are the periodic observations, replacement of parts/fillings required over few thousand kilometers running of an Automobile?
  - What is the reason for emitting the white exhaust smoke during start of the vehicle? How will you prevent this?
  - What is the significance of BS 3 and BS 4 engines?
  - What is king pin offset?
  - Compare Hotchkiss drive & torque tube drive.

**SECTION B**

2. **Attempt any three of the following:** **10 x 3 = 30**
- The air resistance and rolling resistance of a car are given by  $R_a = 0.01V^2$  and  $R_r = 7.5 + 0.25V$ , the resistance being expressed in  $N$  and speed in  $km/h$ . If the transmission efficiency in top gear = 90%, calculate the engine B.P. required at the vehicle speed of 130  $km/h$ . Also find the vehicle acceleration in  $m/s^2$  at the instant when the gear is moving at 50  $km/h$  in top gear. Given engine torque at 50  $km/h = 1.3 \times$  engine torque at 130  $km/h$  and for calculation of force the vehicle can be assumed to be equivalent to weight of 17658  $N$ .
  - A car has pivot pins 114 cm apart, length of each track arm is 15.25 cm and the track rod behind the axle is 104 cm long. Determine the wheel base for true rolling of all wheels, when the inner wheel stub-axle is at  $55^\circ$  to the centreline of the car.
  - Define the following terms and state their significance in respect of vehicle stability:
    - Pitching
    - Rolling
    - Bouncing
    - Yawing
  - A petrol engine has a fuel consumption of 10 litre/h. The air-fuel ratio supplied through the carburetor is 15, the choke has diameter of 20 mm. Determine the diameter of the jet of carburetor if the top of the jet is 5 mm above the fuel level in float chamber. The barometer reads 750 mm height of mercury and the temperature is  $32^\circ C$ . Neglecting compressibility of air. Assume  $C_{da} = 0.85$  and  $C_{df} = 700 \text{ kg/m}^3$ .

(e) Write short notes on following:

- (i) Preventive maintenance
- (ii) Overhauling system

### SECTION C

3. Attempt any *one* part of the following:

10 x 1 = 10

(a) Discuss following types of resistances encountered by a moving vehicle. Which factors influence each of them and how can these resistances be minimized:

- (i) Road resistance
- (ii) Air or Wind resistance
- (iii) Road gradient resistance

(b) A four-speed gear box is to be constructed for providing the ratios of 1.0, 1.46, 2.28 and 3.93 to 1 as nearly possible. The diametral pitch of each gear is 3.25 mm and the smallest pinion is to have atleast 15 teeth. The centre distance between the main and layout shaft is 78 mm. Determine the suitable number of teeth of the different gears and the exact gear ratios thus available.

4. Attempt any *one* part of the following:

10 x 1 = 10

(a) Explain the working principal of two universal joints to obtain constant velocity.

(b) Explain the principle of Ackermann steering gear. A vehicle using Ackermann steering system has a wheel base 280 cm, front wheel track 122 cm, distance between king pin axes 108 cm. If the maximum deflection of the inner front wheel is  $45^\circ$ , calculate:

- (i) The deflection of the outer front wheel assuming true rolling motion of air wheels in this position.
- (ii) The turning radius of outer front wheel.

5. Attempt any *one* part of the following:

10 x 1 = 10

(a) Derive the formula for reaction coming on front and rear wheel of a car when it is descending a hill and brake is applied to front wheel only, in terms of coefficient of friction, gradient, weight of vehicle and vehicle dimensions.

(b) Differentiate clearly between the function of spring and a shock absorber in suspension system. Explain the construction and working of a telescopic type of shock absorber with the help of neat diagram.

6. Attempt any *one* part of the following:

10 x 1 = 10

(a) Why is an ignition system needed in an automobile? What function does it serve? Make comparison between T.C.I. and C.D.I. ignition system.

(b) What are fundamental requirements of a fuel supply system in engine? Sketch and explain the construction and working of a fuel injector.

7. Attempt any *one* part of the following:

10 x 1 = 10

(a) What do you know about break down maintenance? If a diesel vehicle stops on road explain the possibility of stopping the vehicle in sequence.

(b) Classify the pollution control devices used in Automobiles? With the help of neat sketch, describe working of any one.