1963

Code : 15AT61T

Register Number | | | | | | | | | | |

VI Semester Diploma Examination, Nov./Dec. 2018

AUTOMOTIVE MECHANICS

Time : 3 Hours] [Max. Marks : 100

Instruction : Answer any **six** questions from Part – **A** and any **seven** questions from Part – **B.**

PART – A

$6 \times 5 = 30$

1. Define the following :
   (a) Volumetric efficiency
   (b) Relative efficiency

2. Explain Prony brake dynamometer with a sketch.

3. Explain the different parameters on which torque transmitted through clutch depends.

4. Define the following :
   (a) Gear ratio
   (b) Back axle ratio
   (c) Overall gear ratio

5. Derive an expression for turning circle radius of outer front wheel.

6. Explain the concept of weight transfer during braking.

7. Write a note on equivalent weight of vehicle.

[Turn over

8. Define the following terms :

   (a) Stopping distance

   (b) Braking efficiency

9. Explain Ackerman steering mechanism.

PART – B

$7 \times 10 = 70$

10. The following observations were obtained during single cylinder 4-stroke diesel engine :

    Cylinder diameter = 0.24 m

    Stroke length = 0.4 m

    Speed = 250 rpm

    Brake load = 700 N

    Brake drum diameter = 2.1 m

    Mean effective pressure = 6.3×10^5 N/n^2

    Oil consumed = 10 ltr/hr

    Calorific value of oil = 42,000 kJ/kg

    Specific gravity of oil = 0.78

    Calculate :

    (i) Brake power

    (ii) Indicated power

    (iii) Mechanical efficiency

    (iv) Brake thermal efficiency

    (v) Indicated thermal efficiency

11. A 4-cylinder petrol engine has an output of 51.5 kW at 2000 rpm. Morse test was carried out and brake torque readings were 176.3, 169.5, 166.8 and 173.6 N-m respectively. For normal running at this speed fuel consumption is 0.37 kg/min. Heating value of fuel is 43900 kJ/kg. Calculate Mechanical efficiency and Brake thermal efficiency.

12. Derive an equation for torque transmitted through clutch assuming uniform wear conditions.

13. The engine of an automobile runs at a constant speed of 3200 rpm. It is adopted with a 4-speed gear box of gear ratio 1, 1.5, 2.48 and 3.93 : 1 as nearly as possible. The centre distance between the lay shaft and main shaft is 73.12 mm and smallest pinion is to have at least 15 teeth with a module of 3.25 mm. Find the number of teeth on various gear wheels and exact gear ratio in different gears.

14. A track has pivot pins 1.37 m apart. The length of each track rod arm is 0.18 m and the track rod is behind the front axle and 1.27 m long.

Determine wheel back which will give true rolling for all wheels when the car is turning, so that inner wheel stub axle is 60° to the centre line of car.

15. Derive an expression for retardation when brakes are applied to the rear wheels and vehicle is moving down a gradient.

16. In a brake drum with leading and trailing shoe, the total actuating force of 471 N acts at a distance of 0.15 m from the pivot of shoe which is 0.075 m from the axis of the drum of radius 0.09 m. The shoe have symmetrical lining with coefficient of friction 0.45. If the effective radius of the friction force is 0.1 m, calculate the total braking torque, when the mechanism gives equal actuating force.

17. Explain the following with equations to calculate them :

(a) Air resistance

(b) Rolling resistance

(c) Gradient resistance

18. A motor car with wheel base 2.75 m with centre of gravity 0.85 m above the ground and 1.15 m behind the front axle, has a coefficient of adhesion 0.6 between tyre and ground. Calculate the maximum possible acceleration when vehicle is

(i) Driven on front wheels

(ii) Driven on rear wheels

(iii) Driven on all wheels

19. A car having a weight of 14500 N is fitted with an engine developing 31 kW at 2000 rpm, overall gear ratio at the top gear is 4.5 :1. Find out

(a) Speed of the vehicle at given engine speed

(b) Maximum possible acceleration when running on level road with the following details :

(i) Effective diameter of wheel = 0.66 m

(ii) Transmission efficiency = 88%

(iii) Rolling resistance is 140 N/10000 N of weight of vehicle

(iv) Air resistance = $0.0079\ V^2$

(v) Equivalent weight of vehicle = 18150 N

Take, g = 9.81 m/sec^2.