

B.E./B.TECH. Degree Examination, December 2020

Fifth Semester

**AE16504 - VEHICLE DESIGN DATA CHARACTERISTICS**

(Regulation 2016 )

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions

**PART A - (8 X 2 = 16 marks)**

1. When the tractive effort is greater than total resistance on level road. The surplus tractive effort is utilized for
  - (a) Acceleration
  - (b) Hill climbing
  - (c) Draw bar pull
  - (d) All the above.
2. Morse test is used to determine the Indicated Power of a
  - (a) Single cylinder petrol engine
  - (b) Four stroke engine
  - (c) Single cylinder diesel engine
  - (d) Multi cylinder engine
3. The Gas force acting on the piston is obtained by
  - (a) Inertia force x Bore area
  - (b) Cylinder pressure x Stroke length
  - (c) Cylinder pressure x Bore area
  - (d) None of the above
4. The helical gears are commonly used in transmission over spur gears because of
  - (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
5. In what way does the vehicle projected frontal area and vehicle speed influence the motion of the moving vehicle?
6. Interpret how the variation in stroke length influence the power output.
7. Discuss the effect of coefficient of fluctuation of energy.
8. In what way the weight of the vehicle influence the gradient resistance?

**PART B - (4 X16 = 64 marks)**

9. (a) Investigate the factors influencing various resistances to motion of the vehicle. ( 16 )

**(OR)**

(b) Illustrate and explain the effect of Power available at the road wheel and Tractive effort Vs Road speed. ( 16 )
10. (a) Draw the performance curves for the following characteristics of an automotive diesel engine. Variations of Brake Power, Frictional Power, Indicated Power, Torque, Brake mean effective pressure, Mechanical efficiency and Fuel consumption against Speed. ( 16 )

**(OR)**

- (b) In a trial on 6-cylinder, 4-stroke petrol engine of 127 mm bore and 152.4 mm stroke, the net dynamometer load was 200 N at a radius of 762 mm when the speed was 3000 rpm. At this speed and throttle opening the engine required 7.5 kW to motor it with ignition switched off. **( 16 )**

- i) Calculate the mechanical efficiency and the indicated mean effective pressure.
- ii) If the fuel flow is 0.8175 kg/min of heating value 45310 kJ/kg and water flow is 13.64 litre/min with a temperature rise of 55 K, specific heat of the water is 4.18 kJ/kg-K, draw the heat balance sheet in kJ/min.

11. (a) Derive the expression for velocity and acceleration of a piston in terms of crank angle. How will you calculate the inertia force based on the above expression? **( 16 )**

**(OR)**

- (b) Discuss the procedure to find the Gas force, Inertia force and Resultant force of a piston for all the crank angles. **( 16 )**

12. (a) Discuss the need for a gearbox in the automobile. Briefly explain the procedure of calculation of gear ratios for a small car. **( 16 )**

**(OR)**

- (b) A motor vehicle of total weight 11144 N has a road wheels of 0.61 m diameter. The effective moment of inertia of the four road wheels and of the rear axle together is 62.0 N-m<sup>2</sup> while that of the engine and flywheel is 6.2 N-m<sup>2</sup>. The transmission efficiency is 90% and the tractive resistance at a speed of 24 km/hr is 222.5 N. The total available engine torque is 203.6 Nm. Determine **( 16 )**
- i) Gear ratio, engine to back axle ratio, to provide maximum acceleration on an upgrade whose sine is 0.25, when travelling at 24 km/hr.
  - ii) The value of the maximum acceleration
  - iii) The speed of the engine and the power under these conditions.