Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (ME/PE)/SEM-8/ME-811/2010

2010

AUTOMOTIVE ENGINEERING

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) Endurance limit is determined by a test, applying

      a) Completely reversed bending

      b) completely reversed axial loading

      c) Completely reversed torsional loading

      d) Any one of these.

   ii) A hollow shaft of the same cross-sectional area as solid shaft, transmits

      a) Same torque b) Less torque

      c) More torque d) None of these.

http://qpaper.wbut.ac.in

iii) At the first sight a petrol engine is identified by

a) Cylinder size

b) Power output

c) Operating speed

d) Spark plug

e) Size of air cleaner.

iv) The Octane rating of petrol commercially available is usually

a) 85 – 90

b) 90 – 100

c) 100 – 105

d) 110 – 125

e) 125 – 140.

v) The type of rear axle is used in heavy commercial vehicle is

a) Quarter floating b) Semi-floating

c) Three-quarter floating d) Full floating.

http://qpaper.wbut.ac.in

vi) The commonly used material for insulator of spark plug is

a) Bakelite b) Asbestos

c) Alumina d) Copper.

vii) Ignition coil is used to

a) Step up current b) Step down current

c) Step up voltage d) Step down voltage.

viii) Increase of torque in a vehicle is obtained by

a) Decreasing speed

b) Decreasing power

c) Decreasing petrol consumption

d) All of these.

ix) The clutch is located between the transmission and the

a) Engine b) Rear axle

c) Propeller shaft d) Differential.

x) The angle formed by the wheel with the vertical when the top of the wheel slants outward is called

a) Positive camber b) Negative camber

c) Positive castor d) Negative castor.

http://qpaper.wbut.ac.in

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Compare frameless and unitary constructions of passenger car bodies. Explain their basic design features.

3. Sketch and explain the working of torque converter.

4. Explain the working of a centrifugal clutch with a suitable sketch.

5. Draw and explain the curve representing variation of mixture requirements (fuel-air ratios) from no load to full load in an S.I. engine.

6. Explain why worm gear reduction units are not preferred over other types of gear boxes for transmitting large power ? What is the material for worm and worm wheel ?

   Explain why dissimilar materials are used for manufacturing worm and worm wheel ?

7. Deduce the equation of friction torque for single plate clutch using uniform wear theory.

8. What is the importance of lubrication in automobile engine ? Discuss briefly different lubricating systems used in automobile engine. What do you understand by "crankcase ventilation" ?

9. Explain semi-floating type rear axle with neat sketch. In which type of the vehicle is this type of axle used ?

http://qpaper.wbut.ac.in

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

10. a) What do you mean by fuel injection system of a diesel engine ? What are the main objects of fuel pump and fuel injector for diesel engine ?

    b) Why in modern engines petrol injection is preferable than carburetor system ?

    c) Describe the construction and operation of diesel fuel filter. 6 + 5 + 4

11. A 35 kW motor running at 1500 rpm drives a compressor at 750 rpm through a 90° bevel gear arrangement. The pinion has 20 teeth. The pressure angle is 20° full depth. The wheels are capable of withstanding a dynamic stress *i.e*, allowable working stress is given as $f_d = 140 \times \{ 280/(280 + V) \}$ MPa, where V is the pitch line velocity in m/min. The form factor for teeth may be taken as $Y = (0{\cdot}154 - 0{\cdot}912/ Z_f) \prod$, Z_f = formative number of teeth. The face width may be taken as $\frac{1}{4}$ of the slant height of pitch cone. Determine for the pinion, the module, face width, addendum, dedendum, outside diameter and slant height.

http://qpaper.wbut.ac.in

12. a) What is the difference between hydrodynamic and hydrostatic lubrications ?

b) What is the bearing characteristic number ? Explain its significance in journal bearing design.

c) A journal bearing of 50 mm diameter and 80 mm long has a bearing pressure of $6N/mm^2$. The speed of the journal is 1000 rpm. The ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0·15 kg/m-s. The room temperature is 25° C . Determine,

i) the amount of artificial cooling required.

ii) the mass of coolant oil required, if the difference between the outlet and inlet temperature of the oil is 10°C. The specific heat of the oil is 1900J/kg/°C and heat dissipation is $500 W/m^2/°C$. 4 + 4 + 7

13. a) Explain the working principle of simple carburetor referring a diagram.

b) What do you mean by constant choke and constant vacuum carburetors ?

c) Differentiate between SU and Solex carburetor. 6 + 4 + 5

http://qpaper.wbut.ac.in

14. A pulley keyed to a shaft, midway between the two end bearings. The bending moment at the pulley varies form –150 Nm to + 500 Nm, as the torsional moment in the shaft varies from 50 Nm to 160 Nm. The material properties of the shaft are : f_u = 540 MPa, f_y = 400 MPa. Determine the shaft diameter. The fatigue stress concentration factor for the keyway in bending and torsion may be taken as 1·6 and 1·4 respectively. Take factor of safety as 2, size factor K_{sur} = 0·88.

http://qpaper.wbut.ac.in