GUJARAT TECHNOLOGICAL UNIVERSITY
BE- VIIth SEMESTER–EXAMINATION – MAY/JUNE- 2012

Subject code: 171902   **Date: 08/06/2012**
Subject Name: Automobile Engineering
Time: 02:30 pm – 05:00 pm   **Total Marks: 70**
Instructions:
  1. **Attempt all questions.**
  2. **Make suitable assumptions wherever necessary.**
  3. **Figures to the right indicate full marks.**

Q.1 **(a)** i) Write about important events of history of an Automobile. Also **04**
write few name of vintage car.
ii)) "Stability & safety in a modern car is greatly improved" comment **03**
on the statement

(b) i) How is the car specified? Draw schematic diagram showing the **04**
layout of the transmission system of a four wheel drive vehicle.
ii) What are the periodic observations, replacement of parts/fillings **03**
required over few thousand kilometers running of an Automobile?

Q.2 **(a)** i) Evaluate the statement: **05**
  (i)   Diaphragm clutch is more popular in most of the modern car.
  (ii)   Synchromesh device is not used in first & reverse gear.
  (iii)   Most of the modern cars are front wheel drive.
  (iv)   Automatic transmission system is more comfortable even
          though it is not used in Indian cars.
  (v)   Automobiles have gone electronic oriented from mechanical
          based system.
ii) Write short note on CNG or LPG as a engine fuel. **02**

(b) A motor car weighs 11200 N & the engine develops 41 kW at 4500 **07**
rpm, The combined air & rolling resistance is given by the formula R= $40.8+ 0.051V^2$,where R is in Newton & V in km/hr. The performance
characteristic is such that it will reach 120.5 km/hr at 4500 rpm & full
throttle when engine is running in still air. At the same engine speed in
second gear, it will just climb a gradient of 1:10. The top & second
gear ratio is 5:1 & 8:1 respectively. Calculate:
(i) The efficiency of transmission in Ist & IInd gear.
(ii) The engine power required for second gear when climbing up a
gradient of 1: 20 at 48 km/hr.

OR
(b) A motor car takes a right turn of 90 m mean radius at speed of 90 **07**
km/hr. Each road wheel has moment of inertia of 2.0 kgm² & effective
radius of 0.4 m. The rotating parts of the engine weighing 650 N
having a radius of gyration of 0.1m. Engine flywheel rotates in
clockwise direction when viewed from rear. The back axle ratio is 4: 1.
The car weight is 900 kg & its CG is 0.9 m above ground level.
Determine the magnitude of the centrifugal & gyroscopic couple
stating its direction. Which of the wheel likely to be lifted first if speed
increased?

Q.3 **(a)** i) Explain the principle of a friction clutch. Discuss the desirable **03**
properties of friction material for the clutch plate.
ii) With the help of road performance curve explain the necessity of **02**
gear box in an Automobile. **02**
iii) Compare hotch kiss drive & torque tube drive.

(b) An Automobile is fitted with a cone clutch have the following **07**
parameters:

Face width of lining material $= 0.071$m
Effective mean diameter $= 0.285$m
External radius $= 0.15$m
Coefficient of friction $= 0.3$
Axial force applied $= 1050$ N
Moment of inertia of rotating parts $= 4.4$ kg.m^2
Speed $= 1225$ rpm

The clutch works under uniform wear condition.
Calculate the time required to attain full speed & energy lost in sleeping.

OR

Q.3 **(a)** i) Compare hotch kiss drive & torque tube drive. **02**
ii) Draw schematic diagram of differentia unit. **02**
iii) Sketch arrangement of fully floating rear axle & identify various **03**
loads that it has to withstand.

(b) A constant mesh gear box which gives three forward speeds. Above **07**
gear box gives a top gear ratio of unity & first gear ratio of 3.3:1. The
centre distance between lay shaft & engine shaft is to be 13 cm & lay
shaft speed is half of the engine shaft speed. Gear teeth of module 3.1
mm are to be employed. Design a gear box giving the number of teeth
of various gears and find exact gear ratio.

Q.4 **(a)** i) Derive the formula for reaction coming on front & rear wheel of a **04**
car when it descending a hill and brake applied to front wheel only in
terms of coefficient of friction, gradient, weight of vehicle & vehicle
dimensions
ii) Draw & explain working of a tandem master cylinder. State the **03**
function of fluid check valve & bypass port in it.

(b) The distance between king pins of a car is 140 cm. The stub axle & **07**
track arm are 180 mm and 200mm respectively. The length of the track
rod is 130 cm.
Determine wheel base which will gives true rolling for all wheels when
the car is turning so that the inner wheel stub axle is making 60° to the
centre line of the car. Also find turning circle radius of all the wheels.

OR

Q.4 **(a)** i) Define the following terms: **04**

    (i) Power steering   (ii) Adjustable steering
    (iii) Collapsible steering   (iv) Centre point steering

ii) Explain the following terms: **03**

    i) -ve camber angle (ii) –ve castor angle (iii) -ve scrub radius

Q.4 (b) A motor car provided with Ackermann steering mechanism have **07**
following
dimensions:

Length of track arm	= 22.5 cm
Length of each stub axle	= 25.0 cm
Length of track rod	= 135 cm
Length of wheel track	= 200 cm
Outside lock angle	= 35^0
Height of CG from ground	= 60 cm
Distance of CG from front axle	= 170 cm
Car speed on level track	= 80 km/hr
Coefficient of friction	= 0.65

Determine minimum distance in which the car may be stopped when:

        (i)   Front wheels are braked.
        (ii)   Rear wheels are braked.
        (iii)   All four wheels are braked.

Q.5 (a) i) Differentiate clearly between the working of :   **04**
    (i) Spring & shock absorber
    (ii) Antiroll bar & pan hard rod
    (iii) Conventional & independent suspension
    (iv) Hydrolastic & Hydragas suspension system

ii) With the neat sketch explain the working of a telescopic shock **03**
absorber.

(b) i) Describe battery operation by showing chemical reaction in a lead **04**
acid battery. Write about different test carried out to know the
condition of battery.

ii) What is the function of following: **03**
    (i) Sun visor (ii) Sliding roof (iii) Winch

OR

Q.5 (a)   (i) Draw cross section of an automobile tyre. How it is specified?   **03**
  (ii) Describe the requirement of a wheel. Draw & explain alloy cast **04**
wheel.

(b) i) What are the different safety provisions made in a modern car?   **03**
ii) Write about Hybrid vehicle and concept car.   **02**
iii) Distinguish between full insurance and third party insurance.   **02**

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