ARAI®
Progress through Research

Instructions:
1. Figures to right indicate full marks.
2. Draw neat figures wherever required.
3. Assume suitable data wherever necessary.
4. Answers to the two sections should be written in two separate answer sheets.

Date: 22.11.14   Time: 2.00 PM to 5.00 PM   Max. Marks: 100

Section – I

Note: Attempt any five questions out of six from Section-I.

Q.1.   Attempt the following questions.   (10)
1. Explain various load acting on chassis frame.
2. Explain M4 layout of vehicle with Advantages & Disadvantages.

Q.2.   Attempt the following questions.   (10)
1. Explain electric power steering system.
2. A motor car has a wheelbase of 2.743m and pivot centre of 1.065m. The front and rear wheel tract is 1.217m. Calculate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheel when the angle of inside lock is 40^0.

Q.3.   Answer the following questions: (10)
1. Explain need & function of differential in a vehicle.
2. Explain Automatic Manual Transmission system with neat sketch.

Q.4.   Answer the following questions.   (10)
1. Design a shaft for fully floating rear axle if
   Engine Power = 80kW at 5000rpm
   Gear Box ration = 4:1, 2.4:1, 1.5:1 and 1:1.
   Differential Reduction = 5:1
   Shear stress for shaft material = 65Mpa
2. Differentiate between radial and non-radial tyre with neat sketch.

Q.5.   Answer the following questions: (10)
1. Why the Propeller shaft generally made hollow?
2. Explain effect of tyre pressure with neat sketch.

Q.6.   Answer the following questions.   (10)
A sliding type gear box with four forward and one reverse speed having following gear ratios :

Gear ration in top gear	=	1:1
Gear ration in third gear	=	1.38:1
Gear ration in second gear	=	2.24:1
Gear ration in first gear	=	3.8:1
Gear ration in reverse gear	=	3.8:1

Determine the suitable number of teeth of different gears. Assume counter shaft or layshaft speed is half that of the engine speed and smallest gear is not to have less than 15 teeth.

Section – II

Q7. **Answer the Following:** (10)

1. What is the current across the load with a resistance of 10 ohms and a supply voltage of 115V?
2. The ____ is present in a vehicle to stabilize during cornering.
3. The material which covers the spark plug has to be an_____.
4. The Shoes in the Drum brakes are called as _____ shoe & _____ shoe.
5. Vehicle Ride will be comfortable if, _____mass is kept minimum.
6. Alternator produces/supplies _____energy in an automobile.
7. Which of the following is not a part of vehicle Chassis?
   a. Suspension   b. Brakes   c. Wheels   d. Seats
8. When braking is applied, brake fluid from the master brake cylinder moves through brake lines and into the_____.
   a. Wheel Cylinder   b. Brake Cylinder   c. Piston   d. None of the Above
9. With a leaf spring type of suspension, interference between steering and suspension system can be reduced to minimum when_____.
   a. Front end of the spring is pin joined and the rear end is shackled
   b. Front end of the spring is shackled and rear end is pin jointed
   c. Both ends of the springs are pin jointed

Q8. Answer ANY TWO of the Following: (10)

1. Explain how maximum driving comfort & driving safety is achieved by the Suspension System in a Vehicle?
2. Compare Semiactive & Active Suspension Systems.
3. Explain the working of Active suspension system which uses hydraulic actuator. Also draw the block diagram of this system.

Q9. Answer ANY ONE of the Following: (10)

1. Explain McPherson Strut Suspension system and discuss about its merits.
2. Write note on the following:
   i)   Torsion Bars
   ii)   Air Springs

Q10. Answer Any Four of the Following: (20)

1. Explain the function of ABS with a Schematic diagram.
2. List the advantages & disadvantages of Drum brake against Disc brake.
3. List out the requirements of a Charging System in a vehicle.
4. Discuss about the components in a Starting System with a neat layout.
5. Explain about testing & troubleshooting of Electrical systems in a vehicle.

---All the Best---