Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(AUE-OLD)/SEM-5/AUE-505/2012-13

2012

AUTOMOTIVE CHASSIS

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 × 1 = 10

   i) The central part of universal joint is called the

      a) trunnion b) elbow

      c) bearing d) spider.

   ii) The angle between tyre centre line and vertical line is called

      a) camber b) caster

      c) king pin inclination d) toe in angle.

   iii) Pit man arm is a part of

      a) chassis b) steering system

      c) gear system d) suspension system.

iv) Sliding pair is used in

a) Ackerman steering b) Davis steering

c) Both (a) & (b) d) None of these.

v) During turning of the vehicle which wheel turns more angles ?

a) Outer wheel

b) Inner wheel

c) Both the wheel turns same

d) None of these.

vi) A rack and pinion steering gear has a 7 tooth pinion of 10 mm pitch. If an effort of 20 N is applied by 490 mm diameter steering wheel the movement ratio is

a) 20 b) 22

c) 2·2 d) π.

vii) Variable rate spring is used in

a) two wheeler b) light passenger car

c) heavy vehicle d) none of these.

viii) Energy stored per unit volume is greater in case of

a) leaf spring b) coil spring

c) same for two d) impossible to say.

ix) To pavement uneven tyre wear we should give

a) Positive camber b) Negative camber

c) Zero camber d) All of these.

x) Ratio of pivot distance to wheel base in case of Davis steering is

a) 4 to 5 b) 0.4 to 0.5

c) 0.04 to 0.05 d) 0.4 to 1.

GROUP – B

(Short Answer Type Questions)

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

2. What are camber and caster angle ? Explain the role of Zero camber and caster angle.
3. What are the advantages and disadvantages of rear mounted rear wheel drive engine of a vehicle ?
4. Describe with a neat sketch Toe-out on turn of a vehicle.
5. Write about the different types of rear axle casing used in automobile. Compare them.
6. Describe different types of leaf spring used in automobile with neat sketch.

GROUP – C

(Long Answer Type Questions)

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

7. a) Describe the different kinds of load coming on the chassis. 7

   b) A vehicle of 15 kN has wheel base of 2.5 m. The centre of gravity of the vehicle is 1270 mm behind the front axle and 760 mm above the ground. The vehicle is turning at 60 kmph at a curved path of radius 60 m. Wind is blowing at 50 kmph. Calculate stress developed on the longitudinal member of the chassis. Assume C section of the chassis with moment of inertia 70×10^{-8} m^4 and dist of c.g. is 4.2 cm. Height of the vehicle is 1.5 m and length is 3 m. 8

8. a) What is the condition of true rolling on a circular path ? 3

b) Derive and explain the equation of Ackerman Steering mechanism with a neat sketch. 6

c) A bus having wheel base 5 m and pivot centre distance 1.5 m, turns when inner front wheel stub axle making an angle of 65 degree with centre line of bus. Calculate turning circle radius of all wheels. Assume the wheels are placed 150 mm from pivot points. 6

9. a) Describe a steering system with a neat sketch and mentioning the function of each part. 8

b) Write about the different kinds of rear axle shaft and hub arrangement with neat sketches. 7

10. a) How does a rigid axle suspension system differ from an independent suspension system ? 2

b) Discuss different types of independent suspension system. 5

c) A coil spring with 10 numbers of turns and diameter 120 mm is made of 15 mm diameter wire. The spring is designed to carry 5 kN load. G = 80 GPa. Calculate

i) allowable shear stress

ii) deflection per active turn

iii) energy stored per unit volume. 8