Bansilal Ramnath Agarwal Charitable Trust's
VISHWAKARMA INSTITUTE OF INFORMATION TECHNOLOGY

Department of Mechanical Engineering

End Semester Assessment Examination

M. E. (Mechanical) (Design Engineering), 2013-Course

ELECTIVE – II

Date: 02-06-2015 Time: 2.30 am to 5.30pm

Time: 3 Hr.] **[Max. Marks: 50**

Instructions:

1. **Answer Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6**
2. **Question number 7 and 8 are compulsory**
3. **Figures to the right indicate full marks.**

Q. 1 a) Derive an Expression for maximum tractive, effort when the vehicle is climbing hill and equation of motions? (5)

b) Explain performance of tires on wet surface? (3)

c) What are the types of tires? Explain any one type using necessary figure? (2)

OR

Q. 2 a) Explain the condition for front wheel lockup and rear wheel lock up with necessary equations? (5)

b) Explain (i) Toe-in, Toe-out (ii) Reference frame iii) camber and camber thurst iv) slip angle and aligning torque ? (3)

c) Explain the steering geometry with suitable sketch? (2)

Q. 3 a) A van showing in fig1. Braking with the forces shown there at the front and rear axle. Determine the braking condition for this condition.

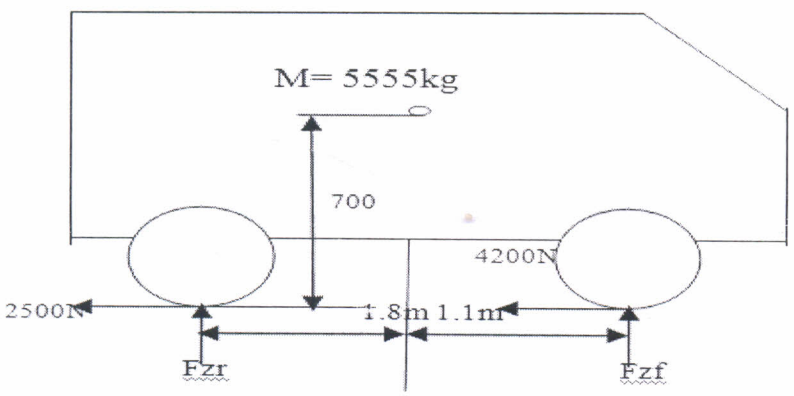

Fig1.

(5)

b) What is rolling resistance? Show the tire axis system with the help of neat sketch explain each term? (3)

c) Explain roll centre analysis. (2)

OR

Q. 4 a) Explain i) antilock brake systems ii) Electronic brake assist system iii) Anti drive and anti squat geometry. (5)

b) A passenger car weighs 21.24 KN and has a wheel base of 2.87m. The C.G of the car is 1.27m from the front axle and 0.508m above the ground level. The braking force distribution on the front axle is 60% coefficient of rolling resistance is 0.02 determine which set of tires lock first if 1) μ is 0.8 2) μ is 0.2. (3)

c) Explain calculation of spectral density? (2)

Q. 5 a) Explain steady state handling characteristic of two axle vehicle with necessary equations ? (5)

b) A truck of mass 6800kg has a brake system capable of exerting an instantaneous braking effort of 670kw at 17.88 m/s velocity while travelling at the speed the driver seize in his path an obstacle i.e. 45m away assuming driver reaction time in ¾ quarter of second and assuming deceleration and before hitting the obstacle calculate stopping distance. (3)

c) Define the terms under steer, over steer and neutral steel write v characteristic equation for each (2)

OR

Q. 6 a) what are the types of testing of handling characteristic of vehicle? Explain each of them in detail. (5)

b) Derive an expression for braking performance and stopping distance ? (3)

c) Explain air suspension with neat sketch? (2)

Q. 7 a) what are the numerical methods for determining the response of a quarter-car model to irregular surface profile excitation (5)

b) Write down the relation between input and output spectral density. (5)

Q. 8 a) use the same robot shown fig2 below. Suppose that the waist joint rotates 90°, the shoulder joints rotates 90°, the elbow joint rotate 0°, and the X, Y and Z translation between the base and global origin are 10, 10 and 0, respectively. Assume that the base thickness is 5, the waist thickness is 10, the offset on Z is 2 the length of the lower arm is 12, and length of the upper arm is 8. Also, suppose that the location of an arbitrary point is (5, 5, 5) with respect to the $(U\text{-}V\text{-}W)_3$ coordinate system. What is the location of point with respect to the global coordinate system? (10)

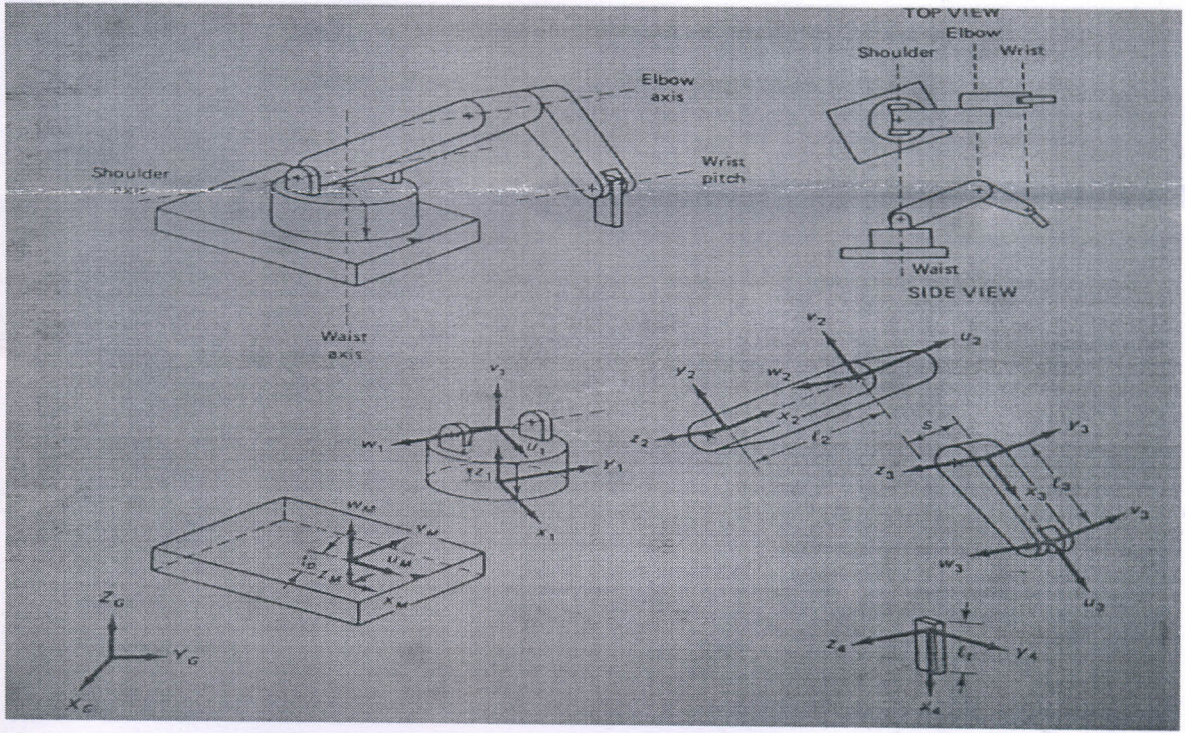
TOP VIEW
Elbow
Shoulder
Wrist
Elbow axis
Shoulder axis
Wrist pitch
Waist
SIDE VIEW
Waist axis

Fig 2.