R13

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
## B.Tech III Year I Semester Examinations, November/December - 2016
## VEHICLE DYNAMICS
### (Automobile Engineering)

Time: 3 hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

## PART - A

(25 Marks)

| | | |
|---|---|---|
| 1.a) | What are the sources of vibration of a vehicle? | [2] |
| b) | Define transmissibility. Give the expression to find the force transmitted to the ground? | [3] |
| c) | What is the mathematical formulae for driveline efficiency. | [2] |
| d) | What are the Factors effecting the gear box design. | [3] |
| e) | What is meant by Active Suspension? | [2] |
| f) | Sketch the Quarter car active suspension model of a passenger car. | [3] |
| g) | Explain the use of LQR in Vehicle Dynamics. | [2] |
| h) | Define Tire Deflection Transfer Function. | [3] |
| i) | List out the advantages of numerical method over matrix method. | [2] |
| j) | Explain Goughs tire characteristics. | [3] |

## PART - B

(50 Marks)

| | | |
|---|---|---|
| 2.a) | Enumerate the types of tires. | |
| b) | Differentiate between Bias Ply and Radial ply tires. | [5+5] |

**OR**

| | | |
|---|---|---|
| 3.a) | What is purpose of belted radial ply tires? | |
| b) | Define Cornering Stiffness and derive the expression. | [5+5] |

| | | |
|---|---|---|
| 4.a) | Derive an expression for the braking efficiency and breaking distance. | |
| b) | What are the forces applied on the parked car on a banked road with an expression. | [5+5] |

**OR**

| | | |
|---|---|---|
| 5.a) | Why the vibration measurement is necessary in dynamic systems? | |
| b) | Derive an expression for the driveline and efficiency using required sketch. | [5+5] |

6.a) Explain about H infinite control method.
   b) Explain about merits and demerits of H infinite control method. [5+5]

**OR**

7.a) What is meant by LQ problem?
   b) Enumerate the merits and demerits of Air suspension system. [5+5]

8.a) Enumerate the aerodynamic forces and moments acting on the vehicle.
   b) A vehicle of total weight 50 KN is held at rest on a slope of $10^0$. It has a wheel base of 2.25 m and its CG is 1.0 m in front of the rear axle and 1.5 m above the ground level. Find the normal reaction at the wheel. W = 50 KN, $\emptyset$ = 10, b = 2.25 m, $l$ = 1 m, h-1.5 m, Rr = W/b (((b-$l$)cos $\emptyset$)-(h sin $\emptyset$)), Rf = W/b(($l$ cos $\emptyset$)+(h sin $\emptyset$)).
   c) What are the factors that influence rolling resistance? [3+4+3]

**OR**

9.a) Explain the load distribution of a four wheeler on a level road.
   b) Define Grade Resistance, draw bar pull and gradeability.
   c) Sketch the schematic diagram of Vehicle longitudinal dynamics. [3+4+3]

10.a) Explain the mechanical vibrations using the lagrange method.
   b) What is the principle of orthigonality and explain the natural frequencies using sweeping matrix. [5+5]

**OR**

11.a) What are the mechanical vibration elements?
   b) Explain the time response of vibrating system briefly. [5+5]

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