Code: P18AET15

HALL TICKET NUMBER

PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE
(AUTONOMOUS)
IV B.TECH I SEMESTER END SUPPLEMENTARY EXAMINATIONS, MARCH-2023
VEHICLE DYNAMICS
(AME Branch)

Time: 3 hours   Max. Marks: 60

Note: Question Paper consists of Two parts (Part-A and Part-B)
PART-A
Answer **all** the questions in Part-A (**5X2=10M**)

Q.No.		Questions	Marks	CO	KL
1.	a)	Write about earth fixed coordinate system.	[2M]	1	2
	b)	Illustrate the vehicle stability on a banked track.	[2M]	2	1
	c)	Discuss the concept of vibration absorber with an example.	[2M]	3	1
	d)	Briefly explain about the transmissibility ratio of a vibration system.	[2M]	4	2
	e)	Discuss briefly about the aerodynamic forces.	[2M]	5	1

PART-B

Answer One Question from each UNIT (5X10=50M)

Q.No.		Questions	Marks	CO	KL
		UNIT-I			
2.	a)	What do you mean by Magnification factor? Derive a suitable expression for calculating the magnification factor for a single degree of freedom.	[5M]	1	1
	b)	Elaborate on the forces distribution during braking of a vehicle.	[5M]	1	2
		OR			
3.	a)	Derive the equation for free and forced vibration for two degrees of freedom.	[5M]	1	2
	b)	Explain about the lumped mass vehicle fixed coordinate system with motion variables.	[5M]	1	2
		UNIT-II			
4.	a)	Discuss in detail about the distribution of weight of a four wheeled vehicle.	[5M]	2	6
	b)	Derive an expression to find the normal reactions at the front and rear wheels considering the stability of a vehicle on a slope of θ to the horizontal.	[5M]	2	2
		OR			
5.	a)	Derive suitable expressions and discuss about Ackermann geometry for vehicle and trailer motions.	[5M]	2	2
	b)	List the parameters affecting vehicle handling characteristics.	[5M]	2	1
		UNIT-III			
6.		A vehicle of total weight 49050 N is held at rest on a slope of 10°. It has a wheelbase of 2.25 m and its centre of gravity is 1.0 m in front of rear axle and 1.5 m above the ground level. Find i) the normal reactions at wheels ii) assuming that sliding does not occur at first, what will be the angle of slope so that the vehicle will overturn? iii) Assuming all the wheels are to be braked, what will be the angle of slope so that the vehicle will begin to slide if the co-efficient of adhesion between the tire and the ground is 0.35.?	[10M]	3	2
		OR			
7.	a)	What are the different tire models? Explain about the concept in detailed.	[5M]	3	2

	b)	Write the magic formulae for tire models and explain the terms involved in detail.	[5M]	3	2
UNIT-IV					
8.		Derive the equation for free and forced vibration for single degree of freedom for i) Under damped conditions ii) Over damped conditions iii) Critically damped conditions	[10M]	4	1
OR					
9.		Derive the expression to calculate the Magnification factor when a single degree of freedom system is subjected to an external force. Also draw the Magnification factor vs frequency ratio. Present your observation from the curve.	[10M]	4	2
UNIT-V					
10.	a)	What do you mean by an aerodynamic aid? Discuss in detail with suitable examples and sketches.	[5M]	5	1
	b)	Describe and explain Electronic Stability Program (ESP)? With neat diagram.	[5M]	5	2
OR					
11.		A passenger car weighs 20 kN and has a wheelbase of 2.8m. The center of gravity is 1270 mm behind the front axle. If a pair of radial ply tires, each of which has a cornering stiffness of 45.88 kN/rad, are installed in the front and a pair of bias ply tires each of which has a cornering stiffness of 33.13 kN/rad are installed in the rear. (i) Determine whether the vehicle is understeer (or) oversteer. Also calculate the critical speed of the vehicle as appropriate. (ii) What would happen to the steady state handling characteristics of the vehicle, if the front and rear tires are interchanged.	[10M]	5	2

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