



B.E/B.TECH DEGREE EXAMINATIONS: APRIL /MAY 2024

(Regulation 2018)

Sixth Semester

AUTOMOBILE ENGINEERING

U18AUI6202: Vehicle Dynamics

COURSE OUTCOMES

- CO1:** Identify the forces acting on vehicle for the given conditions and draw free body diagram.
CO2: Infer and explain the phenomena of the forces that acts on the vehicle.
CO3: Determine the reaction forces induced in the vehicle.
CO4: Develop mathematical model of the vehicle system and elements.
CO5: Provide solution by developing model and solving it.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions: -
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

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|---|-----------------------|
| 1. Sketch SAE Vehicle Axis Diagram. | CO1 [K ₂] |
| 2. Calculate the Load Distribution of a Vehicle having wheel base 1500cm and weight of 1200Kg. The Center of gravity of the Vehicle is at 600 cm from front axle. | CO3 [K ₃] |
| 3. Define Rolling Resistance. | CO2 [K ₂] |
| 4. Sketch SAE Tire Axis Diagram. | CO2 [K ₂] |
| 5. Derive Equation of motion for a having single degree of freedom spring mass system. | CO4 [K ₃] |
| 6. Among Under damping, Over Damping and Critical Damping which will be suitable for Heavy Vehicle Suspension system. Justify your answer. | CO5 [K ₃] |
| 7. Define Aqua Planning and mention how it could be countered. | CO3 [K ₂] |
| 8. List out the Factors that influence the Braking force Distribution | CO5 [K ₂] |
| 9. Define the condition for Resonance occurring due to vibration. | CO4 [K ₂] |
| 10. Draw a free body Diagram of vehicle moving Uphill on a slope while braking. | CO1 [K ₃] |

Answer any FIVE Questions: -
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

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|-----|----|---|----|-----|-------------------|
| 11. | a) | Sketch neat Free Body diagram of an Accelerating vehicle on a flat road condition | 6 | CO1 | [K ₃] |
| | b) | Deduce an Expression for the maximum tractive force that can be generated at the front wheels and rear wheels. | 10 | CO3 | [K ₃] |
| 12. | a) | Explain the Phenomenon of rolling resistance occurred due to pressure Distribution at tire contact patch | 8 | CO2 | [K ₂] |
| | b) | Explain the influence of inflation pressure, vehicle speed and type of road surface on the rolling resistance of the vehicle. With necessary diagrams | 8 | CO2 | [K ₂] |
| 13. | a) | Sketch a Quarter car Model and Free Body Diagram of Sprung Mass and Unsprung Mass. | 8 | CO1 | [K ₃] |
| | b) | Develop a mathematical model of the Simple quarter car Model. | 8 | CO3 | [K ₃] |
| 14. | | With a neat Sketch explain Under Steer, Over Steer and Neutral Steer Using K_{us} Understeer Coefficient Constant. | 16 | CO4 | [K ₂] |
| 15. | | With a neat sketch explain Active Suspension System and Suggest the suitable Suspension for Armed Defense Tank vehicle | 16 | CO5 | [K ₃] |
| 16. | | Explain the Different Properties of Sound and Differentiate Constructive interference and Destructive Interference. | 16 | CO4 | [K ₂] |
