

Total No. of Questions : 9]

SEAT No. :

P2232

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[5254]-563

B.E. (Automobile Engineering) (Semester -I)

MACHINE AND VEHICLE DYNAMICS

(2012 Pattern)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables, slide rule, electronic pocket calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) a) Four masses 30, m1, 30, m2 Kg are attached to shaft which is completely balanced having first and third mass at an angle 20 and 180°. The planes of masses rotating are 300mm apart. Masses can be assumed to be concentrated at radii of 500,600,800 and 300mm respectively. **[10]**

Determine:

- i) Masses M1 and M2
- ii) Its angular position

OR

Q2) a) Explain direct-reverse crank method in brief? **[5]**

b) Explain the term Logarithmic Decrement. **[5]**

Q3) a) Machine having mass of 4 Kg, with spring stiffness 10,000N/m, and damping coefficient 400 N-sec/m. If initial displacement is 2cm and velocity of 20m/s.then, **[10]**

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- i) Find out equation of motion for the system in terms of time.
- ii) Find displacement and velocity at 0.01 sec.

OR

Q4) Derive generalize equation for single degree force vibration due to harmonic excitation and find out phase difference with the help of graphical method.[10]

- Q5)** a) Write a short note on acceleration, gradibility and drawbar pull. [9]
 b) Derive expression for axial loading. [9]

OR

- Q6)** a) Write a short note on nature of forces acting on vehicle and factors affecting the forces in brief. [9]
 b) Explain the terms Draw bar pull, Tractive effort and equivalent mass in brief. [9]

Q7) a) What are the basic components of power limited acceleration system?[6]

b) The information of the drive line of passenger car is as follows, [10]

Engine Inertia: 1.2 Nmax Engine Torque:220 Nm at 4000 rpm

| Transmission Data, | Gear1 | Gear2 | Gear3 | Gear4 | Gear5 | GearR |
|-------------------------------|-------|-------|-------|-------|-------|-------|
| Inertia | 1.3 | 0.9 | 0.7 | 0.5 | 0.3 | 1.5 |
| Ratio | 4.28 | 2.79 | 1.83 | 1.36 | 1.00 | 6.0 |
| Efficiency:0.97 for all gears | | | | | | |

Final Drive, Inertia: 1.4 N Ratio:3.12 Efficiency: 0.99

Wheel inertia:15N wheel radius: 30cm

From the above data calculate:

- i) Effective inertia of the vehicle,
- ii) Maximum tractive effort available at wheel
- iii) Actual tractive effort available at the wheel for 2nd and 4th gear.

OR

- Q8)** a) Explain the terms constant Deceleration and Braking efficiency in brief.[6]
- b) Consider a light truck weighing 5000Kg applied brake to stop the vehicle from 80 Km/hr, which develop brake force 2400N. Determine Deceleration, stopping distance, stopping time energy dissipated during braking and power at initial brake point of brake application. [10]

- Q9)** Write a short note on (any four) [16]
- i) Yaw velocity
 - ii) Under steer and over steer
 - iii) Constant steer angle test for vehicle handling
 - iv) Mathematical model of handling
 - v) Active and semi active suspension
 - vi) Vibration Sources in vehicle

