[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2064)

14702

B. Tech 6th Semester Examination

Vehicle Dynamics

AU-6003

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question each of the section A, B, C and D. Section E is compulsory.

SECTION - A

1. A circular cylinder of mass 4 kg and radius 15 cm is connected to a fixed support through a spring of stiffness 4000 N/m as shown in (Fig. 1). The cylinder is free to roll on a smooth horizontal surface without slip. Determine the natural frequency of the system.

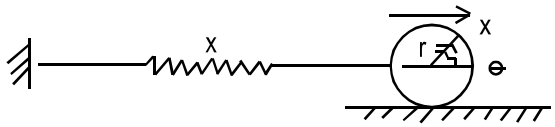

Fig. 1 (15)

2. Design a dynamic vibration absorber with nearest frequency of the system at least 20% from the excitation frequency of a reciprocating machine weighing 25N running at 6000 r.p.m. (15)

SECTION - B

3. An industrial truck of total mass 8 tonne has two pairs of wheels of 400 mm radius. The radius of gyration of each wheel is 300mm. The axles are 2.4 meter apart and centre of gravity of the truck is midway at a height of 1.5m above the road surface. If the truck is moving with a tractive force of 5.4 kW acting through its C.G. calculate

   (i) Acceleration of the vehicle.

   (ii) Frictional Resistance.

   (iii) Reaction of the wheels. (15)

4. A car weighing 200 kN, goes round a curve of 60m radius banked at an angle 30º find the friction force acting on the tyres and normal reaction on the inner and outer wheels, when the car is travelling at 96 km/h. The coefficient of friction between the tyres and the road is 0.6, wheel base is 1.6m and height of C.G. is 0.8m above road level. (15)

SECTION - C

5. Explain the following :

   (i) Spring mass frequency.

   (ii) Wheel wobble.

   (iii) Wheel shimmy. (3×5=15)

6. With the help of neat sketch, explain the following :

   (i) Effect of camber on steering.

   (ii) Driving torques on steering.

   (iii) Ride characteristics power consumed by a tyre. (3×5=15)

SECTION - D

7. Find the frequency of vibration of a shaft of negligible weight loaded as shown in (Fig. 2). By using Dunkerley's equation. $E = 2\times10^6$ kg/cm^2. The shaft diameter is 6 cm.

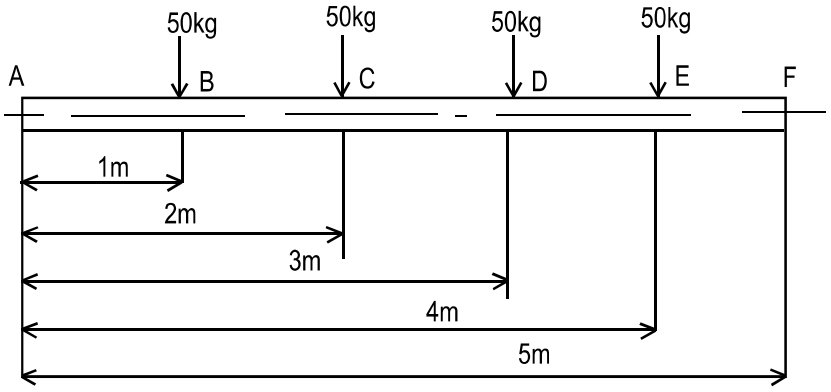

Fig. 2 (15)

8. State and prove Rayleigh method using suitable assumptions. (15)

SECTION - E

9. (i) Define natural vibration.

   (ii) What is resonance?

   (iii) What is viscous duming?

   (iv) What is the difference between natural and damped vibration?

   (v) What do you mean by magnification factor?

   (vi) Name various types of vibration absorber.

[P.T.O.]

(vii) Define tractive effort.

(viii) What are transient effects of cornering?

(ix) Name the driving torques on steering.

(x) Explain the effect of weight transfer during braking.

(xi) What is effective spring rate?

(xii) Define wheel wobble.

(xiii) What is the function of wheel balancing?

(xiv) Name the main parts of the suspension system.

(xv) Define the term over steer and understeer.

(xvi) What do you mean by whirling of shaft?

(xvii) What are the main parts of the steering system?

(xviii) What are the basic functions of a tyre?

(xix) On what factors the rolling resistance depend?

(xx) Where model analysis is to be used? (2×20=40)