Code No. 2343 / N

FACULTY OF ENGINEERING

B.E. 3/4 (M/P) I – Semester (New) (Main) Examination, Nov. / Dec. 2012

Subject : Dynamics of Machines

Time : 3 hours **Max. Marks : 75**

***Note**: Answer all questions from Part–A and answer any **FIVE** questions from Part–B.*

PART – A (10 × 2 ½ = 25 Marks)

1. Explain method of superposition in static analysis.
2. Define isochronism and sensitivity of governor.
3. What are the applications of flywheel?
4. Differentiate coupled and uncoupled locomotives.
5. Define magnification factor and transmissibility.
6. Draw any two mode shapes of simply supported beam.
7. Find the natural frequency of a cantilever beam if a point load 'W' acts at the end of beam and 'Δ' is static deflection at the end.
8. Define terms damping coefficient, and damping factor.
9. Explain Dunkerley's method to determine natural frequency.
10. Find the natural frequency of vibration of the following system shown in fig.1

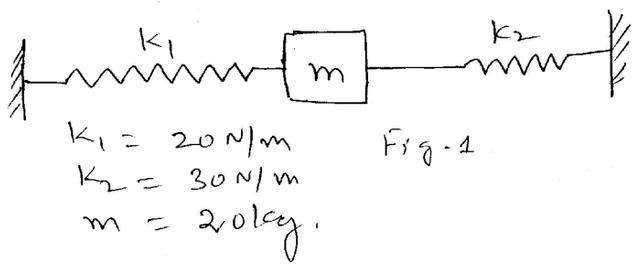

Fig-1

PART – B (50 Marks)

11. A horizontal steam engine running at 240 r.p.m. has a bore of 300 mm and stroke of 600mm. The connecting rod is 1.05 m long and the mass of reciprocating parts is 60 kg. When the crank is 60^0 past its inner dead centre, the stream pressure on the cover side of the piston is 1.125 N/mm^2 while that on the crank side is 0.125 N/mm^2, neglecting the area of the piston rod, determine i) the force in the piston rod, ii) the turning moment on the crank shaft. (10)

12. In a spring controlled governor, the controlling force curve is a straight line. The balls are 400mm apart when the controlling force is 1500 N and 240 mm apart when it is 800N. The mass of each ball is 10 kg. Determine the speed at which the governor runs when the balls are 300 mm apart. By how much should the initial tension be increased to become isochronous governor? Also find isochronous speed.

13. The turning moment diagram for a petrol engine is drawn to a vertical scale of 1 mm to 6 N-m and a horizontal scale of 1 mm to 1^0. The turning moment repeats itself after every half revolution of engine. The areas above and below the mean torque line are 305, 710, 50, 350, 980 and 275 mm^2. The rotating parts amount to a mass of 40 kg at a radius of gyration of 140mm. Calculate the coefficient of fluctuation of speed if the speed of the engine is 1500 r.p.m.

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14. The following data relate to a single-cylinder reciprocating engine. (10)

    Mass of reciprocating parts = 40 kg

    Mass of revolving parts = 30 kg at crank radius

    speed = 150 r.p.m. stroke = 350 mm

    If 60% of the reciprocating parts and all the revolving parts are to be balanced, determine the i) balance mass required at a radius of 320mm ii) Unbalanced force when the crank has turned 45^0 from the TDC. (10)

15. A 22 mm wide and 45mm deep steel bar is freely supported at two points that are 800 mm apart and carrier a load of 180kg midway between them. Determine the natural frequency of the transverse vibration, neglecting the weight of the bar. Also find the frequency of vibration along the length of the shaft. Take E = 250 GN/m^2.

16. In a single-degree damped vibrating system, the suspended mass of 4 kg makes 24 oscillations in 20 seconds. The amplitude decreases to 0.3 of the initial value after 4 oscillations. Find the stiffness of the spring, the logarithmic decrement, the damping factor and damping coefficient. (10)

17. a) Derive an expression for equivalent length of torsionally equivalent shaft with four steps (diameters). (5)

    b) A flywheel having a mass of 20 kg and a radius of gyration of 300mm is given by a spin of 500 r.p.m. about its axis which is horizontal. The flywheel is suspended at a point that is 250mm from the plane of rotation of the flywheel. Find the rate of precession of wheel. (5)

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