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B. TECH.

THEORY EXAMINATION (SEM–VI) 2016-17

DYNAMICS OF MACHINE

Time : 3 Hours *Max. Marks : 100*

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION – A

1. **Attempt all parts of the following questions:** **10 x 2 = 20**
   - (a) What is hammer blow?
   - (b) What do you mean by Gyroscope?
   - (c) Draw the turning moment diagram for a four stroke I.C. engine.
   - (d) What do you mean by coefficient fluctuation of energy?
   - (e) What is the difference between governor and flywheel?
   - (f) Explain the term height of the governor.
   - (g) What is stability of governor?
   - (h) Distinguish between brakes and dynamometers.
   - (i) Explain the term hunting of the governor.
   - (j) What is the difference between free and forced vibration?

SECTION – B

2. **Attempt any five parts of the following questions:** **5 x 10 = 50**
   - (a) Explain the method of balancing of different masses revolving in the same plane.
   - (b) A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.
   - (c) Explain the term height of the governor. Derive an expression for the height in the case of a Watt governor. What are the limitations of a Watt governor.
   - (d) Derive an expression for variation in tractive force and hammer blow for an uncoupled two cylinder locomotive engine.
   - (e) Consider a single cylinder Horizontal engine. Derive the expression for net force acting on the piston, Resultant load on the gudgeon pin and thrust on the cylinder walls and crank effort.
   - (f) Explain the function of governor with neat sketch. State the different types of governors.
   - (g) The turning moment diagram for a multi-cylinder engine has been drawn to a scale 1 mm = 600 N-m vertically and 1 mm = 3° horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end are as +52, -124, +92, -140, +85, -72 and +107 mm2, when the engine is running at a speed of 600 r.p.m. If the total fluctuation of speed is not to exceed ± 1.5% of the mean find the necessary mass of flywheel of radius 0.5m.
   - (h) The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, find : 1. critical damping coefficient, 2. damping factor, 3.logarithmic decrement, and 4. ratio of two consecutive amplitudes.

SECTION – C

Attempt any two parts of the following questions: **2 x 15 = 30**

3. An inside cylinder locomotive has its cylinder centre lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150 kg at the crank pin, and the reciprocating masses per cylinder to 180 kg. The wheel centre lines are 1.5m apart. The cranks are at right angles. The whole of the rotating and 2/3 of the reciprocating masses are to be balanced by masses placed at a radius of 0.6 m. Find the magnitude and direction of the balancing masses and also find swaying couple at a crank speed of 300 r.p.m.

4. Derive an expression for the height in the case of a Proell governor.

5. A four wheeled motor car of mass 2000 kg has a wheel base 2.5 m, track width 1.5 m and height of centre of gravity 500 mm above the ground level and lies at 1 metre from the front axle. Each wheel has an effective diameter of 0.8 m and a moment of inertia of 0.8 kg-m2. The drive shaft, engine flywheel and transmission are rotating at 4 times the speed of road wheel, in a clockwise direction when viewed from the front, and is equivalent to a mass of 75 kg having a radius of gyration of 100 mm. If the car is taking a right turn of 60 m radius at 60 km/h, find the load on each wheel