Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2016

Subject Code:2152509 **Date:11/05/2016**

Subject Name:Machine Dynamics

Time:02:30 PM to 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	(i) State and explain D'Alembert's principle. (ii) What is meant by Equivalent offset inertia force? Explain.	**07**
	(b)	If the crank and connecting road are 300 mm and 1 m long respectively and the crank rotates at a constant speed at a constant speed of 200 r.p.m., determine: 1.The crank angle at which the maximum velocity occurs, and 2. Maximum velocity of the piston.	**07**
Q.2	**(a)**	Draw and explain Klien's construction for determining the velocity and acceleration of the piston in a slider crank mechanism.	**07**
	(b)	Explain the method of balancing of different masses revolving in the same plane.	**07**
		OR	
	(b)	The reciprocating mass per cylinder in a 60^0 V-twin engine is 1.5 kg. The stroke and connecting rod length are 100 mm and 250 mm respectively. If the engine runs at 2500 r.p.m., determine the maximum and minimum values of the primary forces. Also find out the resultant secondary force.	**07**
Q.3	**(a)**	Write a short note on primary and secondary balancing.	**07**
	(b)	Derive the following expressions, for an uncoupled two cylinder locomotive engine: (i) Variation is tractive force; (ii) Swaying couple; & (iii) Hammer blow.	**07**
		OR	
Q.3	**(a)**	Explain the Method of Direct and Reverse Crank used for balancing of radial engines.	**07**
	(b)	Discuss briefly with neat sketches the longitudinal, transverse and torsional vibrations.	**07**
Q.4	**(a)**	The mass of a single degree damped vibrating system is 7.5 kg and makes 24 free oscillations in 14 seconds when disturbed from its equilibrium position. The amplitude of vibration reduces to 0.25 of its initial value after five oscillations. Determine: 1. Stiffness of the spring. 2. Damping factor, i.e. the ratio of the system damping to critical damping.	**07**
	(b)	Explain the term 'Logarithmic decrement' as applied to damped vibrations.	**07**
		OR	
Q.4	**(a)**	Discuss the effect of inertia of a shaft on the free torsional vibrations.	**07**
	(b)	Explain the terms 'under damping, critical damping' and 'over damping'	**07**
Q.5	**(a)**	State the different types of governors. What is the difference between centrifugal and inertia type governors?	**07**

(b) A gramophone is driven by a Pickering governor. The mass of each disc attached to the centre of a leaf spring is 20 g. The each spring is 5 mm wide and 0.125 mm thick. The effective length of each spring is 40 mm. The distance from the spindle axis to the centre of gravity of the mass when the governor is at rest, is 10 mm. Find the speed of the turntable when the sleeve has risen 0.8 mm and the ratio of the governor speed to the turntable speed is 10.5. Take E = 210 kN/mm^2. **07**

OR

Q.5 **(a)** Define the following terms relating to governors : **07**

(i) Stability, (ii) Sensitiveness, (iii) Isochronism, and (iv) Hunting.

(b) Explain the terms and derive expressions for ‘effort’ and ‘power’ of a porter governor. **07**

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