Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2018

Subject Code:2152509 **Date:20/11/2018**

Subject Name:Machine Dynamics

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

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

			MARKS
Q.1	**(a)**	Differentiate between "Static Force Analysis" & "Dynamic Force Analysis"	**03**
	(b)	Explain concept of D-Alembert's principle for dynamic force analysis.	**04**
	(c)	With dynamic analysis of slider-crank mechanicsm find velocity and acceleration of piston.	**07**
Q.2	**(a)**	In which condition "two point mass dynamically equivalent system" is satisfied?	**03**
	(b)	With neat sketch explain pivoted cradle type dynamic balancing machine.	**04**
	(c)	A horizontal gas engine running at 210 rpm has a bore of 220 mm & a stroke of 440 mm. The connecting rod is 924 mm long & reciprocating parts weigh 20 kg when the crank has turned through an angle of 30° from I.D.C. The gas pressure on the cover & crank sides are 500 kN/m^2 & 60 kN/m^2. Diameter of the piston rod is 40 mm. Determine the Net Piston Effort.	**07**
		OR	
	(c)	How to found countermass and angle of countermass analytically in dynamic balancing. Prove with usual notation.	**07**
Q.3	**(a)**	Only brief conditions for complete balancing of multi-cylinder inline engines.	**03**
	(b)	Why reciprocating masses are partially balanced? How partial balancing of primary unbalanced force in reciprocating engine is done.	**04**
	(c)	A single cylinder reciprocating engine has a speed 240 rpm, stroke 300 mm, mass of reciprocating parts at 150 mm radius 30 kg. If all the mass of revolving parts and two-third of the mass of reciprocating parts are to be balanced, find the balance mass required at a radius of 400 mm and unbalanced force when the crank has rotated 60° from IDC.	**07**
		OR	
Q.3	**(a)**	Briefly explain any one cause, advantage and disadvantage of vibration.	**03**
	(b)	Explain how primary forces are balanced in case of V-engine.	**04**
	(c)	Explain following effect of partial balancing in locomotives (i) Variation of Tractive Force (ii) Swaying Couple.	**07**

Q.4	**(a)**	Name any four material which works as vibration isolators.	**03**
	(b)	Explain logarithmic decrement with displacement versus time curve for under damped system.	**04**
	(c)	Mass of 120 kg placed 250 mm from one end. The shaft dia. is 40 mm. Determine the frequency of natural vibrations if the length of the shaft is 700 mm. E= 200 GN/m^2	**07**

OR

Q.4	**(a)**	Write conditions for two system to be equivalent in case of torsional vibrations of geared system by neglecting inertia of gears.	**03**
	(b)	Find the ratio of amplitudes of rotors of torsional vibrations of a two-rotor system.	**04**
	(c)	A horizontal circular disc of 400 mm diameter and 20 kg mass is supported by a vertical stepped shaft at the centre. The shaft has two steps. First step is 20 mm diameter and 200 mm length and second step is of 15 mm diameter and 250 mm length. Determine the frequency of torsional oscillations of the disc if modulus of rigidity of shaft is 80 x 10^3 N/mm^2.	**07**
Q.5	**(a)**	How function of governor differes from flywheel.	**03**
	(b)	Deduce governing equation of porter governor considering friction at the sleeve.	**04**
	(c)	Each arm of proell governor is 240 mm long and each rotating ball has a mass of 3 Kg. The central load acting on the sleeve is 30 kg. The pivots of all arms are 30 mm from the axis of rotation. When the sleeve of the governor is in the mid-point position, the extension link of lower arm are vertical.In this postion, the radius of path of rotation of the mass is 195 mm, the vertical height of the governor is 190 mm & the governor speed is 180 rpm. Detemine the lengths of extension links and the tension in the upper arm.	**07**

OR

Q.5	**(a)**	Why inertia governors are quicker compared to centrifugal governor.	**03**
	(b)	Find expression of effort and power of porter governor.	**04**
	(c)	Explain (i) Sensitiveness of a Governor (ii) Isochronism with usual notations.	**07**

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