Scheme of Valuation/Answer Key

(Scheme of evaluation (marks in brackets) and answers of problems/key)

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2019

Course Code: ME304

Course Name: DYNAMICS OF MACHINERY

Max. Marks: 100 Duration: 3 Hours

PART A

		Answer any three full questions, each carries 10 marks.	Marks
1	a)	Configuration diagram - 3 marks Free body diagram of links - 6 marks Torque = 878Nm (counter clockwise) - 1 marks	(10)
2		**Graphical Method** Configuration diagram - 3 mark Vector diagram of links - 6 marks Torque - 1 marks **Analytical Method:** Free body diagram/Configuration diagram – **3** Equilibrium equations – 5 Torque -2 **(Graphical/analytical/virtual work/matrix method can be used for solving the problem)**	(10)
3	a)	Configuration diagram -3 marks Inertia force = - 4236 N - 1 mark Inertia torque due to reciprocating parts = -248 Nm - 1 mark Correction torque = 45.07 Nm - 2 mark Torque due to weight of mass = - 27.14 Nm counter clockwise - 2 mark Total inertia torque on the crank shaft = 320.2 clockwise - 1 mark	(10)
4	a)	Statement - 2 marks Explanation - 3 marks	(5)

	b)	Figure - 2 marks Explanation - 3 marks	(5)
		PART B	
		Answer any three full questions, each carries 10 marks.	
5		Turning moment diagram - 3 marks Resultant turning moment diagram - 2 marks Power developed = 4.24KW - 1 marks Maximum fluctuation of energy = 11.78 Nm - 1 marks Coefficient of fluctuation of speed = 0.04 or 4% - 1 marks Coefficient of fluctuation of energy = 0.0278 or 2.78 % - 1marks Maximum angular acceleration of the flywheel = 292 rad/s^2 - 1 marks	(10)
6	a)	Table – - 4 marks Primary crank and secondary crank position -2 mark Couple polygon - 2 marks Force polygon - 2 marks	(10)
7		Gyroscopic couple - 2 marks Centrifugal couple - 2 marks Total over turning couple - 2 marks Balancing couple - 2 marks Angle of heel -2 marks (Wheel radius (Rw) was not given in the question. So, a suitable value can be assumed or an expression with Rw can be formulated. Marks in proportion to the number of steps can be given.)	(10)
8		Figure – 1 marks Gyroscopic couple due to four wheels = 37.1 Nm - 2 marks Gyroscopic couple due to rotating parts of the engine = 34.7 Nm – 1 marks Centrifugal force = 9263 N – 1 marks Centrifugal couple = 4631.5 Nm – 1 marks Load on the front wheel 1 = 4322.86 N – 1 marks Load on the front wheel 2 = 7435.26 N – 1 marks	(10)

		Load on the rear wheel 3 = 2374.74 N – 1 marks Load on the rear wheel 4 = 5487.14 N – 1 marks	
PART C			
Answer any four full questions, each carries 10 marks.			
9	a)	Explanation - 2 marks	(2)
	b)	1. Stiffness of the spring = 877 N/m - 2 marks 2. Logarithmic decrement = 0.278 - 2 marks 3. Damping factor = 0.0442 - 2 marks 4. Damping coefficient = 7.4 N/m/s - 2 marks	(8)
10	a)	1. Stiffness of each spring = 49368 N/m - 4 marks 2. Dynamic force transmitted = 39.27 N - 3 marks 3. Natural frequency of the system = 45.35 Hz - 3 marks	(10)
11	a)	Figure - 1 mark Explanation of term dynamic magnifier – 2 marks Explanation of term transmissibility - 2 marks	(5)
	b)	It can be solved with the given data. Moment of inertia as 10^9 or 109 mm^4 and E as 205x103 or 205x10^3 N/mm^2 can be used. Deflection values may not be reasonable as the given data are not correct. Marks shall be given if the students use correct data and get different answers.	(5)
12		Figure of torsionally equivalent shaft – 4 marks 1. Diameter 'd' mm for the shaft CD = 91.7 mm - 3 mark 2. Natural frequency of free torsional vibration = 3.33 Hz – 3 marks	(10)
13	a)	Explanation of term whirling speed of a shaft - 2 marks proof - 3 marks	(5)
	b)	Figure of shaft - 1 marks Static deflection due to 1 kg of mass at the centre = 28x10^{-6} m - 1 marks Static deflection due to mass of the shaft = 0.133x10^{-3} m - 1 marks Frequency of transverse vibration = 43.3 Hz - 1 marks Whirling speed of a shaft = 2598 rpm. - 1 marks	(5)

14	a)	Node lengths l_A = 1.146 m OR 0.4356 m - 2 marks l_C = 1.91m OR 0.726 m - 2 marks Figure - 4 mark Frequency 1 = 171 Hz - 1 mark Frequency 2 = 277 Hz - 1 mark	(10)
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