P P SAVANI UNIVERSITY

Fifth Semester of B. Tech. Examination

November 2022

SEME3031 Dynamics of Machinery

29.11.2022, Tuesday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1	Answer the Following: (Any Four)	**[04]**	**CO**	**BTL**
(i)	Define: Hammer Blow		**2**	**1**
(ii)	What do you understand by partial balancing of locomotives?		**2**	**2**
(iii)	Enlist function of flywheel.		**1**	**1**
(iv)	Define: Coefficient of Fluctuation of Speed.		**1**	**1**
(v)	Name the materials used for flywheel applications.		**1**	**1**
Q - 2 (a)	Explain D'Alembert principle?	**[05]**	**1**	**3**
Q - 2 (b)	The piston diameter of an internal combustion engine is 125 mm and the stroke is 220 mm. The connecting rod is 4.5 times the crank length and has a mass of 50 kg. The mass of the reciprocating parts is 30 kg. The centre of mass of connecting rod is 170 mm from the crank pin centre and the radius of gyration about an axis through the centre of mass is 148 mm. The engine runs at 320 rpm. Find thee magnitude and direction of inertia force and the corresponding torque on the crankshaft when the angle turned by the crank is 140^0 From the dead centre.	**[06]**	**1**	**5**
	OR			
Q - 2 (b)	The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 N-m; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm2. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.	**[06]**	**1**	**5**
Q - 3 (a)	Explain balancing of V Engine.	**[05]**	**2**	**3**
Q - 3 (b)	The four masses m_1, m_2, m_3 and m_4 are attached to a shaft and revolve in the same plane. The masses are: 12 kg, 10 kg, 18 kg and 15kg respectively. The radius of rotation is: 0.4 m, 0.5m, 0.6m and 0.3m respectively. The angle between m_2, m_3 and m_4 are 60^0 ,135^0 and 250^0 from m_1. Determine the magnitude and direction of balancing mass required at a radius 0.1 m by: 1) The graphical method 2) The analytical method.	**[06]**	**2**	**5**
	OR			
Q - 3 (b)	A twin cylinder V- engine having V angle of 60^0 has strokes of 120 mm and the connecting rods of length 240 mm. The mass of reciprocating parts per cylinder is 2 kg. if the crank speed is 2000 r.p.m., determine the magnitude of the primary and secondary forces.	**[06]**	**2**	**5**
Q - 4	Attempt anyone.	**[04]**		
(i)	Draw Turning moment diagram for a 4-stroke cycle I.C. Engine.		**1**	**3**

(ii)	In slider crank mechanism, the crank is 300 mm long and connecting rod 850 mm long. The piston is of 90 mm in diameter and gas pressure acting on the piston is 5 Mpa. When the crank has moved through 45⁰ from I.D.C. find a) Thrust in connecting rod b) Reaction from guide (Piston side thrust) c) Torque acting on crankshaft. d) Load on main bearing (radial load).		1	4

SECTION – II

Q - 1	Answer the Following:	[04]		
(i)	Define: Force Transmissibility		3	1
(ii)	Define: Natural Frequency		3	1
(iii)	Define: Damping		3	1
(vii)	List out various types of vibration isolating materials.		3	1
Q - 2	Attempt any two.	[14]		
(a)	List out various methods of vibration analysis and explain any one in brief.		3	2
(b)	Find the natural frequency of vibration of the system shown in figure 1. Use following data: $K_1 = 1000$ N/m, $K_2 = 1000$ N/m, $K_3 = 2000$ N/m, m = 10 kg.		3	3

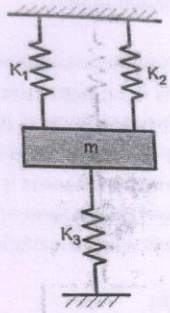

Figure. 1

(c)	What are the various method to determine to determine the critical speed of shaft carrying Multiple rotors? Explain any one in brief.		3	2
Q - 3	Attempt anyone.	[06]		
(a)	Classify "Governors' and prove for Watt governor, height of the governor h = 895 / N^2. Where N is speed of rotation of sleeve.		4	3
(b)	Define the following terms in context of governor: i) Isochronism ii) Stability iii) Effort iv) Power v) Coefficient of insensitiveness vi) Sleeve Lift.		4	2
Q - 4	Attempt anyone.	[06]		
(i)	Draw neat sketch and explain centrifugal governor.		4	3
(ii)	Derive the equation for energy dissipation in Viscous Damping.		3	3

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create