Code No: **R31033** **R10** **Set No. 1**

III B.Tech I Semester Supplementary Examinations, May - 2017

DYNAMICS OF MACHINERY

(Common to Mechanical Engineering and Automobile Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1	a)	What do you mean by Spin, Precession and gyroscopic planes?	[7M]
	b)	The rotor of a marine turbine has a moment of inertia of 750 kg.m^2 and rotates at 3000 rpm clockwise when viewed from the front. If the ship pitches with angular simple harmonic motion having a periodic time of 16 sec and amplitude of 0.1 radian find i) The maximum angular velocity of the rotor axis ii) The maximum value of the gyroscopic couple iii) The gyroscopic effect as the bow dips.	[8M]
2	a)	Derive the expression for the friction torque of a flat collar bearing by uniform wear theory.	[7M]
	b)	A pivot bearing of a shaft consists of a frustum of a cone. The diameters of the frustum are 200 mm and 400 mm, and its semi-cone angle is 60^0. The shaft carries a load of 40 kN and rotates at 240 rpm. The coefficient of friction is 0.02. Assuming the intensity of pressure to be uniform, determine i) The magnitude of pressure, and ii) The power lost in friction.	[8M]
3	a)	Explain about epicyclic train dynamometer with neat diagram?	[5M]
	b)	A simple band brake is operated by a lever of length 450 mm. The brake drum has a diameter of 600 mm, and the brake band embraces 5/8th of the circumference. One end of the band is attached to the fulcrum of the lever while the other end is attached to a pin on the lever 120 mm from the fulcrum. The effort applied to the end of the lever is 2 kN, and the coefficient of friction is 0.30. Find the maximum braking torque on the drum.	[10M]
4	a)	Draw the tuning moment diagrams for the following different types of engines, neglecting the effect of inertia of the connecting rod: i) Single cylinder double acting steam engine ii) Four stroke cycle. I.C. engine	[7M]
	b)	A Punching press is driven by a constant torque electric motor. He press is provided with a flywheel that rotates at maximum speed of 225 rpm. The radius of gyration of the flywheel is 0.5m.The press punches 720 holes per hour, each punching operation takes 2 seconds and requires 15 kN-m of energy. Find the power of the motor and minimum mass of the flywheel if speed of the same is not to fall below 200 rpm?	[8M]

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5 In a Porter governor, the upper and lower arms are each 250 mm long and are pivoted on the axis of rotation. The mass of each rotating ball is 3kg and the mass of the sleeve is 20 kg. The sleeve is in its lowest position when the arms are inclined at 30^0 to the governor axis. The lift of the sleeve is 36 mm. Find the force of the fiction at the sleeve, if the speed at the moment it rises from the lowest position is equal to the speed at the moment it falls from the highest position. Also find the range of the governor. [15M]

6 a) A number of masses (say four masses) are attached to a shaft which is rotating at an angular speed of ω rad/s. If all the masses are in the same plane, then describe the analytical method of balancing these four masses by a single mass only? [7M]

b) A,B,C and D are from masses carried by a rotating shaft at radii 100mm, 150mm, 150mm and 200mm respectively. The planes in which masses rotate are spaced at 500mm apart and the magnitude of the masses, B, C, and D are 9Kg, 5Kg and 4Kg respectively. Find the required mass A and the relative angular settings of the 4 masses so that the shaft shall be in complete balance. [8M]

7 a) Explain about hammer blow and swaying couple? [7M]

b) Prove that a maximum secondary unbalanced forces is l/n times maximum primary unbalanced for n cylinders reciprocating engine. [8M]

8 a) Explain about torsional vibrations, two and three rotor systems? [7M]

b) A machine part having a mass of 2.5 kg vibrates in a viscous medium. A harmonic exciting force of 30 N acts on the part and causes a resonant amplitude of 14 mm with a period of 0.22 second. Find the damping coefficient. If the frequency of the exciting force is changed to 4 Hz, determine the increase in the amplitude of the forced vibrations upon the removal of the damper. [8M]

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