Q.P. Code: 18ME0310 **R18**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Regular Examinations Feb-2021

THEORY OF MACHINES

(Agricultural Engineering)

Time: 3 hours Max. Marks: 60

PART-A

(Answer all the Questions **5 x 2 = 10** Marks)

1	a	Define Co efficient of fluctuation of energy.	**2M**
	b	Write the principle of Dynamometer.	**2M**
	c	Define effort and power of governor.	**2M**
	d	What is balancing of rotating masses?	**2M**
	e	Define Whirling speed (or) critical speed	**2M**

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2	a	Explain the effect of gyroscopic couple on a Aeroplane. An aircraft makes a half circle of 50 m radius towards left, when flying at 200 km/hr.	**5M**
	b	The engine and the propeller of the plane has a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 rpm clockwise when viewed from the rear. Find the gyroscopic couple and its effect on the aircraft.	**5M**

OR

3		The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship: 1. when the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h. 2. when the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.	**10M**

UNIT-II

4		A band brake acts on the 3/4th of circumference of a drum of 450 mm diameter which is keyed to the shaft. The band brake provides a braking torque of 225 N-m. One end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum. If the operating force is applied at 500 mm from the fulcrum and the coefficient of friction is 0.25, find the operating force when the drum rotates in the (i) anticlockwise direction, and (ii) clockwise direction.	**10M**

OR

5		Describe the construction and operation of a (i) Prony brake and (ii) rope brake absorption dynamometer with neat sketch.	**10M**

UNIT-III

6		The arms of a Porter governor are each 250 mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the balls is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the speed range of the governor. If the friction at the sleeve is equivalent of 20 N of load at the sleeve, determine how the speed range is modified.	**10M**

OR

7 A Hartnell governor having a central sleeve spring and two right-angled bell crank levers moves between 290 r.p.m. and 310 r.p.m. for a sleeve lift of 15 mm. The sleeve arms and the ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120 mm from the governor axis and mass of each ball is 2.5 kg. The ball arms are parallel to the governor axis at the lowest equilibrium speed. Determine: 1. loads on the spring at the lowest and the highest equilibrium speeds, and 2. stiffness of the spring. **10M**

UNIT-IV

8 A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance. **10M**

OR

9 Derive the following expression of effects of partial balancing in two cylinder locomotive engine (i) Variation of attractive force (ii) Swaying couple (iii) Hammer blow **10M**

UNIT-V

10 A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 GN/m2 Determine the frequency of longitudinal and transverse vibrations of the shaft. **10M**

OR

11 **a** A vibrating system consists of a mass of 200 kg, a spring of stiffness 80 N/mm and a damper with damping coefficient of 800 N/m/s. Determine the frequency of vibration of the system. **5M**

b Derive the Natural Frequency of Free Torsional Vibrations **5M**

END