SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech II Year II Semester Regular & Supplementary Examinations June-2024
THEORY OF MACHINES
(Common to ME & AGE)

Time: 3 Hours   **Max. Marks: 60**

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

1	a	The turning moment diagram for a four stroke gas engine may be assumed for simplicity to be represented by four triangles, the areas of which from the line of zero pressure are as follows: Suction stroke = 0.45×10^{-3} m2; Compression stroke = 1.7×10^{-3} m2; Expansion stroke = 6.8×10^{-3} m2; Exhaust stroke = 0.65×10^{-3} m2. Each m2 of area represents 3 MN-m of energy. Assuming the resisting torque to be uniform, find the mass of the rim of a flywheel required to keep the speed between 202 and 198 r.p.m. The mean radius of the rim is 1.2 m.	CO1	L3	8M
	b	Draw a turning moment for single cylinder double acting steam engine.	CO1	L3	4M

OR

2		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.	CO1	L3	12M

UNIT-II

3		Explain the working of a single-plate clutch with neat sketch	CO2	L1	12M

OR

4	a	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.	CO2	L3	6M
	b	Distinguish between absorption and transmission dynamometers.	CO2	L4	6M

UNIT-III

5	a	How the governors are classified?	CO3	L1	6M
	b	Explain with neat sketch the working principle of centrifugal governor.	CO3	L3	6M

OR

6		In an engine governor of the Porter type, the upper and lower arms are 200 mm and 250 mm respectively and pivoted on the axis of rotation. The mass of the central load is 15 kg, the mass of each ball is 2 kg and friction of the sleeve together with the resistance of the operating gear is equal to a load of 25 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40°, find, taking friction into account, range of speed of the governor.	CO3	L3	12M

UNIT-IV

7   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   CO4   L3   10M

b What is primary unbalanced force and secondary unbalanced force?   CO4   L1   2M

OR

8   A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190°, both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine: 1. The magnitude of the masses at A and D ; 2. the distance between planes A and D ; and 3. the angular position of the mass at D.   CO4   L3   12M

UNIT-V

9 a 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.   CO5   L3   10M

b Define Whirling speed (or) critical speed.   CO5   L1   2M

OR

10   Calculate the whirling speed of a shaft 20 mm diameterand 0.6 m long carrying a mass of 1 kg at its mid-point. The density of the shaft material is 40 Mg/m3, and Young's modulus is 200 GN/m2. Assume the shaft to be freely supported.   CO5   L3   12M

*** END ***