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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year II Semester Regular Examinations July-2021

THEORY OF MACHINES

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1		The propeller of aero weighs 550 N and has radius of gyration of 0.9m. The propeller shaft rotates at 1900 r.p.m, clockwise, as viewed from tail end. The plane turns left, making a U turns, i.e., through 1800 of 125m radius, at a speed of 330 km/hr. Determine the gyroscopic couple and its effect on the aircraft. Also find the reaction on bearings if the distance between two bearings of the propeller is 0.8m.	L5	**12M**

OR

2		The torque exerted on the crank shaft of a two-stroke engine is given by the equation (N-M) =145,00+2300sin2(θ)-1900cos2(θ) where 'θ' is the crank angle angle displacement from the inner dead centre. Assuming the resisting torque to be constant, determine ; 1. The power of the engine when the speed is 150 r.p.m. 2. The moment of inertia of the fly wheel if the speed variation is not to exceed ±0.5% of the mean speed, and 3. The angular acceleration of the fly wheel when the crank has turned through 300 from the IDC.	L5	**12M**

UNIT-II

3	**a**	Explain the working of a single-plate clutch with neat sketch.	L2	**6M**
	b	A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 r.p.m. Determine the outer and inner radii of a frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm2. Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear.	L5	**6M**

OR

4		A torsion dynamometer is fitted to a propeller shaft of a marine engine. It is found that the shaft twists 2° in a length of 20 metres at 120 r.p.m. If the shaft is hollow with 400 mm external diameter and 300 mm internal diameter, find the power of the engine. Take modulus of rigidity for the shaft material as 80 GPa.	L1	**12M**

UNIT-III

5	a	Derive the expression for Porter governor.	L3	**6M**
	b	Derive the expression for Proell governor.	L3	**6M**

OR

6	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.	L5	**12M**

UNIT-IV

7	A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.	L1	**12M**

OR

8	A, B, C and D are four masses carried by a rotating shaft at radii 120, 150, 200 and 180 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 15 kg, 10 kg, and 8 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	L1	**12M**

UNIT-V

9	Derive the natural frequency of Free Transverse Vibrations by (i) Rayleighs method (ii) Dunkerleys method.	L3	**12M**

OR

10	A circular rod of length 1.0 m, supported freely at the ends, is carrying a body of mass 100 kg at 0.35 m from one end. Find the natural frequency of transverse vibration. Assume E = 220 GN/m2 and shaft diameter = 60 mm.	L1	**12M**

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