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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech II Year II Semester Supplementary Examinations March-2021

THEORY OF MACHINES

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

PART-A

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

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| 1 | a | Define co efficient of fluctuation of speed. | 2M |
| | b | Define centrifugal clutch. | 2M |
| | c | What is meant by hunting of governor? | 2M |
| | d | Why rotating masses are to be dynamically balanced? | 2M |
| | e | Distinguish between a traverse and torsional vibration. | 2M |

PART-B

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

UNIT-I

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| 2 | The rotor of a turbine yacht rotates at 1200 rpm clockwise when viewed from stern. The rotor has a mass of 750 kg and radius of gyration of 250 mm. Find the maximum gyroscopic couple transmitted to the hull when yacht pitches with a maximum angular velocity of 1 rad/s. What is the effect of this couple? | 10M |
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OR

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| 3 | A vertical double acting steam engine has a cylinder of 300 mm diameter, 450 mm stroke and runs at 200 rpm. The reciprocating parts have a mass of 225 kg and the piston rod is 50 mm in diameter. The connecting rod is 1.2 m long. When the crank has turned 125° from IDC the steam pressure above the piston is 30 kN/m ² . Calculate (i) crank pin effort (ii) the effective turning moment on the crank shaft. | 10M |
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UNIT-II

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| 4 | a | Describe about rope brake dynamometer with a neat sketch. | 5M |
| | b | Derive an expression for uniform pressure and uniform wear for any one the bearing. | 5M |

OR

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| 5 | A single disc clutch internal and external diameter as 200 mm and 300 mm, the maximum intensity of pressure as 0.06N/mm ² , and the coefficient of friction between shaft surface and plate surface as 0.03 N/mm ² . Determine the power lost in the shaft. Assume uniform wear, shaft speed rating at a speed of 1200 rpm. | 10M |
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UNIT-III

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| 6 | A porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor is at maximum speed. Find the maximum and minimum speed and range of speed of the governor. | 10M |
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OR

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| 7 | A governor of hartnell type has equal balls of mass of 3 kg, set initially at a radius of 200 mm. The arms of the bell crank lever are 110 mm vertically and 150 mm horizontally. Find (i) the initial compressive force on the spring at a radius of 200 mm at 240 rpm and (ii) the stiffness of the spring required to permit a sleeve movement of 4 mm on a fluctuation of 7.5 percent in the engine speed. | 10M |
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UNIT-IV

- 8 A shaft is rotating at uniform angular speed. Four masses M_1 , M_2 , M_3 and M_4 of magnitudes 300 kg, 450 kg, 360 kg, 390 kg respectively are attached rigidly to the shaft. The masses are rotating in the same plane. The corresponding radii of rotation are 200 mm, 150 mm, 250 mm and 300 mm respectively. The angle made by these masses with horizontal is 0° , 45° , 120° , 255° respectively. Find (i) the magnitude of balancing mass (ii) the position of balancing mass if it's radius of rotation is 200 mm. **10M**

OR

- 9 The data for three rotating masses are given below $M_1=4$ kg, $r_1=75$ mm, $\theta_1=45^\circ$, $M_2=3$ kg, $r_2=85$ mm, $\theta_2=135^\circ$, $M_3=2.5$ kg, $r_3=50$ mm, $\theta_3=240^\circ$. Determine the amount of counter mass at a radial distance of 65 mm required for their static balance. **10M**

UNIT-V

- 10 In a single degree of damped vibration system, a suspended mass of 8 kg makes 30 oscillations in 18 seconds. The amplitude decreases in 18 seconds. The amplitude decreases to 0.25 of the initial value after 5 oscillations. Determine (i) the spring stiffness (ii) logarithmic decrement (iii) damping factor (iv) damping coefficient. **10M**

OR

- 11 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/m^2 . Determine the frequency of longitudinal and transverse vibration of the shaft. **10M**

END