MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2018

Subject: **Dynamics of Machinery**

Branch: ME

Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions of the following   5x15M=75M

1. a) What is gyroscopic couple? Derive an expression and explain its effect on spinning masses.
    b) The turbine rotor of a sea vessel having a mass of 900kg and rotating at 1200rpm clockwise while looking from the stern. The vessel pitches with an angular velocity of 1.2rad/s. What will be the gyroscopic couple transmitted to the hull when the bow rises? The radius of gyration of the rotor is 300mm.   [5+10]

2. Determine the torque T required on crank AB of the following mechanism for static equilibrium.   [15]

BE = 40 mm
BC = 66 mm
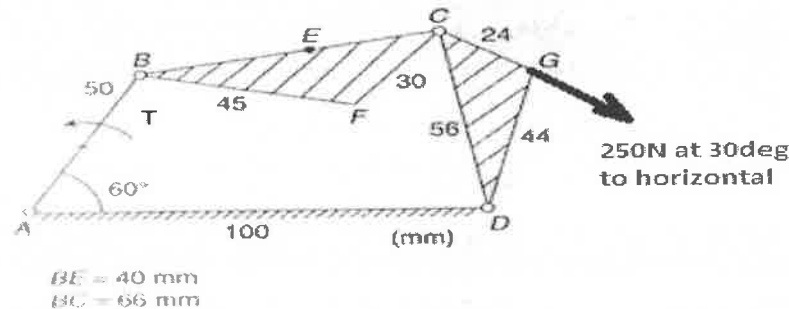
3. Synthesize a four link mechanism for length of smallest link being 120mm to generate $y = x + 2x^2$ in the interval $0 \le x \le 1$ for three accuracy points. The range of angles of input and output links in degrees is $30 \le \Theta \le 80$ and $40 \le \varphi \le 120$.   [15]

4. A multiple disc clutch has 6 active friction surfaces. The power transmitted is 20kw at 400rpm. Inner and outer radii of the friction surfaces are 90 and 120m respectively. Assuming uniform wear with a coefficient of friction 0.3, find the maximum axial intensity of pressure between the discs.   [15]

5. The torque transmitted by a two stroke engine is represented by
    T= (1200 + 600sin Θ+200 sin 2Θ + 20sin 3Θ) N-m; Where Θ= the angle turned by the crank from inner dead center. The engine speed is 1200rpm. Determine the power of the engine and the minimum mass of the flywheel, if its radius of gyration is 800mm and the maximum fluctuation of speed is to be ±1.5% of the mean.   [15]

6. A porter governor has each of its arms of 175mm length pivoted on the axis of the governor. The radii of rotation of the balls at the minimum and the maximum speeds are 105mm and 140mm respectively. The mass of the sleeve is 20kg and each of the balls is 5kg. Determine the range of speed when the friction at the sleeve is i) negligible and ii) 15N. [15]

7. A 90^0- V engine has two cylinder engines which are placed symmetrically. The two connecting rods operate a common crank. The lengths of the connecting rods are 400mm each and the crank radius is 100mm. The reciprocating mass per cylinder is 4.8kg. If the engine speed is 1200rpm, find the resultant primary and secondary forces. Also find the maximum secondary resultant force. [15]

8. Find the frequency of transverse vibrations of a shaft which is supported at the ends and is of 40mm in diameter. The length of the shaft is 5m. The shaft carries three point loads of masses 15kg, 35kg and 22.5kg at 1m, 2m, and 3.4m respectively from the left support. The Young's modulus for the material is $200GN/m^2$.The self weight of the shaft is 18.394kg per meter length [15]