**L.E.College – Morbi**

**Mechanical Engineering Department**

**MID Sem Exam October - 2022**

**SUBJECT NAME: Dynamics of Machinery SUBJECT CODE: 3151911**

**Date: 17 / 09 / 2022 Time: 03:00-04:30**

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| **Q.1** | Derive the equation of fluctuation of energy of flywheel | | **5** | **CO1** | **U** |
|  | **OR** | |  |  |  |
| **Q.1** | A flywheel of steam engine of mass 200 kg. and radius of gyration is 80 cm. the starting torque of steam engine is 130 kg•m and it is assumed to be constant. Determine angular acceleration of flywheel along with speed and kinetic energy after 8 seconds. | | **5** | **CO1** | **A** |
| **Q.2 (a)** | “The problems due to unbalanced masses are more serious for the system rotating at high speed compared to low speed” - Justify the statement | | **2** | **CO2** | **U** |
| **Q.2 (b)** | Prove the statement: “if a system is in Dynamic Blanking it is automatically in Static Balancing.” | | **4** | **CO2** | **A** |
|  | **OR** | |  |  |  |
| **Q.2** | Four masses 150 kg, 200 kg, 100 kg and 250 kg are attached to a shaft revolving at radii 150 mm, 200 mm, 100 mm and 250 mm ; in planes A, B, C and D respectively. The planes B, C and D are at distances 350 mm, 500 mm and 800 mm from plane A. The masses in planes B, C and D are at an angle 105o, 200o and 300o measured anticlockwise from mass in plane A. It is required to balance the system by placing the balancing masses in the planes P and Q which are midway between the planes A and B, and between C and D respectively.  If the balancing masses revolve at radius 180 mm; Decide the magnitude and angular positions of the balance masses. | | **6** | **CO2** | **A** |
| **Q.3** | Interpret the effect of gyroscopic couple on ship with neat sketch | | **3** | **CO3** | **R** |
|  | **OR** | |  |  |  |
| **Q.3** | The moment of inertia of an aeroplane air screw is 20 kg-m2 and the speed of rotation 1000 RPM clockwise when seen from the front. The speed of the flight is 200 km per hour. Determine the gyroscopic couple on the plane when it makes a left handed turn on a path of radius 150 m. | | **3** | **CO3** | **E** |
| **Q.4** | For the system in Fig 1. If K1= 2800 N/m, K2= 1400 N/m, K3= 3800 N/m, K4 = K5 = 700 N/m; find the mass m such that the system will have a natural frequency of 15 Hz. FIG.1 | | **7** | **CO4** | **E** |
|  | Define: I). Natural frequency, II). Damping, III). Forced Vibration. IV) Degree of Freedom V) Resonance | | **5** | **CO4** | **R** |
|  | **OR** | |  |  |  |
| **Q.4** | The mass 'm' is hanging from a chord attached to the circular homogeneous disc of mass 'M' and radius 'R' as shown in Figure. The disc is restrained from rotating by a spring attached at radius 'r' from the centre. If the mass is displaced downwards from rest position, determine the frequency of oscillations Figure 2 | | **7** | **CO4** | **U** |
|  | Write down detail Classification of vibrations. | | **5** | **CO4** | **R** |
| **Q.5** | Name the methods to find critical speed of shaft carrying multiple rotors. Explain any one in detail. | | **4** | **CO5** | **U** |
|  | Figure 1 | Figure 2 |  |  |  |

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\*\*\*\*\*\*ALL THE BEST \*\*\*\*\*\*