



## III B.Tech I Sem Supply End Examination, December 2022

**Dynamics of Machinery**

(Mechanical)

**Time: 3 Hours.****Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part - A, answer all questions which carries 20 marks.

3. In Part - B, answer any one question from each unit.

Each question carries 10 marks and may have a, b as sub questions.

**PART- A****(10\*2 Marks = 20 Marks)**

- |       |  |    |     |     |
|-------|--|----|-----|-----|
| 1. a) | State gyroscope and its applications                                   | 2M | C01 | BL1 |
| b)    | List the different motions for stability of ship                       | 2M | C01 | BL2 |
| c)    | What is the function of flywheel                                       | 2M | C02 | BL1 |
| d)    | Define and write expression for fluctuation of speed                   | 2M | C02 | BL1 |
| e)    | What are the Advantages of using clutches in automobiles               | 2M | C03 | BL2 |
| f)    | Classify the brake dynamometers  | 2M | C03 | BL2 |
| g)    | Define the term hunting of the governor                                | 2M | C04 | BL1 |
| h)    | State the hammer blow  | 2M | C04 | BL1 |
| i)    | Define frequency and resonance   | 2M | C05 | BL1 |
| j)    | Differentiate between longitudinal vibration and transverse vibrations | 2M | C05 | BL2 |

**PART- B****(10\*5 Marks = 50 Marks)**

- |      |   |    |     |     |
|------|---|----|-----|-----|
| 2 a) | Derive the expression for gyroscopic couple   | 5M | C01 | BL3 |
| b)   | An airplane makes a complete half circle of 50m radius, towards left, when flying at 200km/hr. The rotary engine and the propeller of the plane has a mass of 400kg and a radius of gyration of 0.3m. The engine rotates at 2400 rpm clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it | 5M | C01 | BL3 |

**OR**

- |   |   |     |     |     |
|---|---|-----|-----|-----|
| 3 | The turbine rotor of a ship weighs 6 tons and has a radius of gyration 600mm. It rotates at 1800 rpm clockwise when viewed from front. Determine the gyroscopic effect. | 10M | C01 | BL3 |
|   | a) If the ship travelling at 1860 m/hour and when it steers to the right in a curvature of 100 m radius.  |     |     |     |
|   | b) If the ship pitches with 10 rad/s angular velocity and when nose moves down.   |     |     |     |

4 A single cylinder single acting four stroke gas engine develops 20kW at 300 rpm. The work done by the gases during the expansion stroke is three times the work done on the gases during the compression stroke, the work done during the suction and exhaust strokes being negligible. If the total fluctuation of speed is not to be exceed  $\pm 2\%$  of the mean speed and the turning moment diagram during compression and expansion is assumed to be triangular in shape, find the moment of inertia of the flywheel.

**OR**

5 a) Draw turning moment diagram reciprocating engines 5M C02 BL3  
 b) Derive the expression for Maximum Fluctuation of Energy. 5M C02 BL3

6 A multiple disc clutch has 6 active friction surfaces. The power transmitted is 20kW at 400 rpm. Inner and outer radii of the friction surfaces are 90 and 120 mm respectively. Assuming uniform wear with a coefficient of friction 0.3. Find the maximum intensity of pressure between the discs

**OR**

7 Sketch and explain the rope brake dynamometer 10M C03 BL4

8 A Proell governor is 240 mm long and each rotating ball has a mass of 5 kg. The central load acting on the sleeve is 25 kg. The pivots of all the arms are 30 mm from the axis of rotation. The vertical height of the governor is 190 mm. The extension links of the lower arms are vertical and the governor speed is 180 rpm when the sleeve is in the mid-position. Determine the lengths of the extension links and the tension in the upper arms

**OR**

9 a) Derive the equation of speed the porter governor 5M C04 BL3  
 b) Discuss the any two types of characteristics of Governors 5M C04 BL3

10 Derive the natural frequency of spring mass system 10M C05 BL6

**OR**

11 Discuss the terms a) Damping ratio b) critical damping c) over damping d) under damping 10M C05 BL3

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**CO - Course Outcome**

**BL - Blooms Taxonomy Levels**