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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E.

Branch: Aerospace Engineering

Course Code: 21AE7DERDY

Course: Rotor Dynamics

Semester: VII

Duration: 3 hrs.

Max Marks: 100

Date: 05.03.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1	a) Derive the governing differential equation of motion and natural frequency of Jeffcott rotor model.	10
	b) Explain the different methods of attenuation of vibration.	6
	c) Explain the Rankine rotor model with respect to the different orbital motions of the mass	4

OR

2	a) Derive the governing differential equation of motion and natural frequency of single degree of freedom Un-damped free and forced rotor model.	12
	b) A rotor has a mass of 10 kg and the operational speed of 100 ± 1 rad/s. What are the bounds of the effective stiffness of the shaft so that the critical speed does not fall within 5% of the operating speed? Assume that there is no damping the rotor system.	4
	c) Define i) Whirling of shaft, ii) Critical speed, iii) Asynchronous whirl iv) Synchronous whirl	4

UNIT - II

3	a) Explain the influence of Number of Pads and influence of preload on the dynamic coefficients in tilt pad bearings.	8
	b) List the Reynolds equation assumptions for calculating the performance of the hydrodynamic bearing.	6
	c) Explain the influence of Pivot Stiffness and influence of bearing length or pad length.	6

OR

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

4 a) List the types of rolling contact bearings and explain any two with neat sketches. **8**

b) List the types of fixed-geometry sleeve bearing and explain any two with neat sketches. **8**

c) Explain the failures in rolling contact bearing. **4**

UNIT - III

5 a) Derive the governing equations for instability analysis due to rotary seals. **10**

b) Explain the influence of the rotational speeds and pressure differences on the seal's dynamic coefficients. **10**

UNIT - IV

6 a) Determine the four critical speeds of rigid rotor mounted on simple anisotropic springs as bearings. **10**

b) Derive the gyroscopic moments equation for motion of a rotor mounted on two bearings. **10**

UNIT - V

7 a) Illustrate the vibration-based identification of faults. **10**

b) Explain with neat sketches, visual presentation of vibration measurements- waterfall and campbell diagram **10**
