BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M. TECH. **SEMESTER : II**
BRANCH: MECHANICAL **SESSION : SP/22**

SUBJECT: ME538 ROTORDYNAMICS

TIME: 02 hours **FULL MARKS: 50**

INSTRUCTIONS:

1. **Attempt any 10 questions.**
2. **Each question carries 05 marks.**
3. **The missing data, if any, may be assumed suitably.**

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1. Obtain the solution of $\ddot{x} + 2\zeta\omega_n x + \omega_n^2 x = 0$ for $\zeta < 1$.
2. Explain eigenvalues and eigenvectors in the context of a vibration problem of multi degree of freedom system.
3. Explain orthogonality condition.
4. What is a Jeffcott rotor? Derive the equation of motion for a Jeffcott rotor supported on rigid bearings.
5. What is a forward whirl and a backward whirl?
6. What are the assumptions in deriving Reynolds equation? Write any four assumptions.
7. Write the equation of motion of a rigid rotor supported on journal bearings.
8. What is stability? How is the threshold of instability obtained?
9. What is gyroscopic effect in rotating shafts?
10. Write the four equations of motion for a rigid rotor on isotropic bearing neglecting gyroscopic effect.
11. What are the various steps in finite element modelling?
12. Describe the finite element modelling of a bar in axial loading.