

# The Assam Royal Global University, Guwahati

Royal School of Engineering & Technology  
B.Tech. Mechanical Engineering, 6<sup>th</sup> Semester  
Semester End Examination, July 2021  
Course Title: Dynamics of Machines  
Course Code: MEE022C601

Time: 3 Hours

Maximum Marks: 70

**Note: Attempt all questions as per instructions given.**

*The figures in the right-hand margin indicate marks.*

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## Section – A

1. Attempt **all** questions. (Maximum word limit 50) 2 x 8
  - a. Define the term free body diagram and state the importance of drawing such a diagram.
  - b. Determine the acceleration produced in a body of  $50\text{ kg}$  mass when it is acted upon by a force of  $125\text{ N}$ . Use D'Alembert's principle.
  - c. Define free vibrations and natural frequency of vibration.
  - d. What is degree of freedom of a vibrating system?
  - e. Define forced vibrations and resonance.
  - f. What is a vibration absorber?
  - g. What is the function of a governor? How does it differ from that of a flywheel?
  - h. What do you understand by gyroscopic couple?
  
2. Attempt **any two** of the following: 6 x 2
  - a. The turning moment diagram for a petrol engine is drawn to the following scales: turning moment,  $1\text{ mm} = 5\text{ N-m}$ ; crank angle,  $1\text{ mm} = 1^\circ$ . The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are  $295, 685, 40, 340, 960, 270\text{ mm}^2$ . The rotating parts are equivalent to a mass of  $36\text{ kg}$  at a radius of gyration of  $150\text{ mm}$ . Determine the coefficient of fluctuation of speed when the engine runs at  $1800\text{ rpm}$ . [6]
  - a. A block of mass  $50\text{ kg}$  resting on a horizontal plane, is required to be given an acceleration of  $2\text{ m/s}$  towards right by applying a push  $P$  at an angle of  $45^\circ$  with the horizontal. Assuming the coefficient of friction between the block and the plane is  $0.4$ , calculate the magnitude of push  $P$ . Obtain your solution by applying D'Alembert's principle. [6]
  - b. Explain the turning moment diagram of a four-stroke internal combustion engine. [6]
  
3. Attempt **any two** of the following: 7 x 2
  - a. Explain the energy method in vibration analysis. A circular cylinder of mass  $5\text{ kg}$  and radius  $20\text{ cm}$  is connected by a spring of stiffness  $3000\text{ N/m}$ . It is free to roll on horizontal surface without slipping. Determine the natural frequency. [3 + 4]