Student Exam No._____

GANPAT UNIVERSITY

B. TECH SEM- V (Marine) REGULAR EXAMINATION– NOV-DEC 2016

2MR504 - DYNAMICS OF VIBRATION

Time: 3 Hours **Total Marks: 60**

Instruction: (1) This Question paper has two sections. Attempt each section in separate answer book.

(2) Figures on right indicate marks

(3) Be precise and to the point in answering the descriptive questions.

Section - I

Que. 1 **(a)** Explain following properties: 1) Resonance 2) Time Period 3) Degree of freedom. **(5)**

(b) Explain under damped, over damped and critical damped system and derive equation for Under damped system. **(5)**

OR

Que. 1 **(a)** Explain Forced Damped Vibration with simple harmonic motion and derive it equation for dynamic vibration[X]. **(10)**

Que. 2 **(a)** An under damped shock absorber is to be designed for a motorcycle of mass 200kg such that during a road bump, the damped period of vibration is limited to 2 secs and the amplitude of vibration should reduce to one sixteenth in one cycle, Find 1) Spring stiffness 2) Damping coefficient of the shock absorber. **(10)**

OR

Que. 2 **(a)** Write a short note on Magnification factor for force damped vibration. **(5)**

(b) A road of circular cross section and of uniform diameter 100mm is fixed at one end. A disc of mass 500 kg is attached at the other end. Radius of gyration of the disc is 250 mm. Length of the rod is 100 cm. Modulus of elasticity of the rod material is 3×10^5 MN/m^2 and modulus of rigidity is 8×10^4 MN/m^2.Find the frequencies of natural Longitudinal, transverse vibration in HZ. **(5)**

Que. 3 **(a)** What you mean by Frequency response curves and also List out the conclusion made from the Frequency curves. **(5)**

(b) Write a short note on Balancing and explain Static and dynamic Balancing. **(5)**

Section - II

Que. 4 **(a)** Explain D'Alembert's principal to find Equation of motion Using FBD Approach. **(6)**

(b) Enlist the applications of gyroscope and explain the gyroscopic properties. **(4)**

OR

Que. 4 (a) A shaft carries four masses A, B, C and D placed in parallel planes, perpendicular to the shaft axis and in the same order along the shaft. The masses of B and C are 36 kg and 25 kg and both are assumed to be concentrated at a radius of a 150 mm, while the masses A and D are both at a radius of 200mm.The angle between the radius of B and C is 100°and that between B and A is 190°, both angles being measured in the same sense. The planes containing A and B are 250 mm apart and those containing B and C are 500 mm apart .If the shaft is to be in complete dynamic balance, find: **(10)**

1. The masses of A and D
2. The distance between planes C and D
3. The angular position of mass D.

Que. 5 (a) Derive the expression for the equivalent length of a shaft which has several steps and explain Torsionally equivalent shaft with neat sketch **(6)**

(b) Explain the torsional vibrations for single rotor system to determine the natural frequency. **(4)**

OR

Que. 5 (a) Two rotors A and B are attached to the end of a shaft 500 mm long, weight of the rotor A is 320 N and its radius of gyration is 300 mm and the corresponding values of B are 500 N and 460 mm respectively. The shaft is 80mm in diameter for the first 250mm, 120mm diameter for the next 100mm and 100mm diameter for the remainder of its length. Modulus of rigidity for the shaft material is 8×10^4 kg/mm^2. Find (i) The position of node and (ii) The frequency of torsional vibration. **(5)**

(b) An electric drives a pump through gearing mechanism. The speed of the motor is 1500 rpm while the speed of the pump is 500 rpm. The motor shaft is 55mm diameter and 240mm long while the pump shaft is 110 mm diameter and 550mm long. The mass M.I. of the motor is 450 kg.m^2 while the mass M.I. of the pump impeller is 1440 kg.m^2. Neglect the inertia of the gear and shaft, determine the frequency of torsional vibration. **(5)**

Que. 6 (a) Establish the expression to determine the frequency of torsional vibrations of a geared system. **(10)**

----------**END OF PAPER**----------