Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: V (Marine) Engineering

Regular Examination Nov – Dec 2015

Dynamic of Vibration-2MR504

Time: 3 Hours / As per Scheme **Total Marks: 70**

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) Describe the rate of decay in oscillations and derive the equation of motion. (5)

(b) Explain under damped, over damped and critical damped system and derive equation for critical damped damped system. (7)

OR

Que.1 (a) A spring mass damper system have following specifications: (12)

Mass- m=4kg

stiffness - k=0.4kN/m

Damping co-efficient - c=40 Ns/m

Determine:

1) Natural frequency for dry friction damping
2) Natural frequency of damped vibrations
3) Amplitude loss per cycle if coulomb damping tighter with frictional force is 10N.

Que. – 2 (a) A shaft 50 mm diameter and 3 meters long is simply supported at the ends and carries three loads of 1000N,1500 N and 750 N at 1 m,2 , and 2.5 m from the left support. The young's modulus for shaft material is 200 GN/m^2.Find the (11)

OR

Que. – 2 (a) Describe the rules of Balancing problem solving for analytical and graphical (5)

(b) For a spring mass dashpot system following cases are Given: (6)

1. £=1 2. £=0.5

Take a mass m=2 kg and stiffness k=500Nm.Find out the equation of motion for the above cases if initial displacement and initial velocity is 0.01 m and 5 m/respectively.

Que. – 3 (a) What you mean by transmissibility curves and also List out the conclusion made from the transmibility curves. (7)

(b) Derive the equation of motion of a simple pendulum. Also find the natural frequency of the system. (5)

Take, Mass m=3 kg, Length of pendulum, L=2m, Neglect the mass of the rod.

Section - II

Que. – 4 (a) Explain the Whirling or Critical speed of shaft for Transverse vibration. (3)

(b) A machine of mass 800 kg is acted upon by an external force of 2 kN at 1200 rpm. A rubber isolator is used to reduce the effect of vibration having a static deflection 3 mm under machine weight. Take damping factor 0.3.Find: (9)

1. Magnification factor
2. Amplitude of vibration
3. Force transmitted
4. Phase log

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 500mm apart .If the shaft is to be in complete dynamic balance, find: (12)

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) Explain Energy Rayleigh's Method for free transverse vibrations of shaft subjected to a number of point loads. (4)

(b) Two rotors A & B are attached to the end of a shaft 500mm long. Weight of the rotor A is 320N and its radius of gyration is 300mm and the corresponding values of B are 500N and 460mm respectively. The shaft is 80mm is 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 $8x10^4$ kg/mm^2. Find (i) Position of the node (ii) Frequency of torsional vibration (7)

OR

Que. – 5 **(a)** Explain the balancing of reciprocating masses in engine and also describe the partial primary balancing. **(4)**

(b) A Single cylinder runs at 250 rpm and has a stroke of 180 mm.The reciprocating parts weight 120 kg and revolving parts equivalent to 70kg at a radius of 90 mm. A mass is kept opposite to the crank at a radius of 150 mm to balance the whole of revolving mass and two third of the reciprocating mass. Determine: **(7)**

1. Magnitude of balancing mass
2. Resultant residual unbalanced force when the crank has turned 30° from the dead center.

Que. – 6 **(a)** A rotor of ship turbine has a mass of 300 kg rotates at 3000 rpm in clockwise direction when viewed from the stern (aft). The radius of gyration of the rotor is 0.3 m. Determine the gyroscopic couple and its effect when, **(9)**

(a) The ship turns left at a radius of 400 m at a speed of 40 km/hr.

(b) The ship pitches with the bow rising at an angular velocity of 1.0 rad/sec, and

(b) Enlist the applications of gyroscope and explain the gyroscopic properties. **(3)**

END OF PAPER