

[6580]-559

B.E. (Mechanical) (Insem)
DYNAMICS OF MACHINERY
(2019 Pattern) (Semester - VII) (402042)

Time : 1 Hour 15 minutes]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figure to the right indicates full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain the concept of unbalanced system and need of balancing the system. [6]

- b) A rotating shaft carries three unbalanced masses of 4 kg, 3 kg and 2 kg at radial distances of 70 mm, 80 mm and 50 mm and at the angular positions of 45° , 135° and 240° respectively. The angular positions are measured counter clockwise from the reference line along x axis and viewing the shaft from the first mass end. The second and the third masses are in the planes at 200 mm and 400 mm from the plane of the 1st mass. The shaft length is 800 mm between bearings and the distance between the plane of 1st mass and the bearing at that end is 200 mm. Determine the amount of counter masses in plane at 100 mm from the bearings for the complete balance of the shaft. The first counter mass is to be in a plane between the first mass and the bearing at a radius 60 mm. The second mass is in a plane between the third mass and the bearing at that end at a radius 40 mm, [9]

OR

Q2) a) Explain the concept of direct & reverse cranks. [6]

- b) Four masses are attached to a shaft in planes A, B, C & D at equal radii. The distance of planes B, C & D from A are 50 cm, 60 cm & 100 cm respectively. The masses at B, C and D are 55 kg, 80 kg and 60 kg respectively. If the system is in complete balance, determine the mass at D and the position of masses B, C & D with respect to 'A'. [9]

P.T.O.

Q3) a) Write short note on stability of two-wheel vehicle moving in curved path.

[7]

- b) An airplane makes a complete half circle of 50 m radius, towards right, flying at 200 Km/hr. The rotating engine and the propeller of the plane have a mass 400 Kg with a radius of gyration of 40 cm. The engine runs at 2400 rpm clockwise when viewed from the rear. Find the gyroscopic couple on the plane and state its effect on it. What will be the effect if airplane turns to its left instead of to the left?

[8]

OR

Q4) a) Explain how the reactive gyroscopic couple is induced when a spinning rotor precesses.

[6]

- b) A ship is propelled by a turbine rotor having a mass of 6000 kg and speed of 2400 rpm. The direction of rotation of rotor is anticlockwise when viewed from the bow end. The radius of gyration of rotor is 450 mm. Determine the gyroscopic effect on ship, when,
- Ship is steering to the left in a curve of 60 m radius at a speed of 18 knots (1 knot = 1860 m/hr)
 - Ship is pitching in S.H.M. with bow descending (falling) with maximum velocity. The time period of pitching is 18 seconds and the ship pitches 7.5° above and 7.5° below the normal position.
 - Ship is rolling and at the instant, its angular velocity is 0.035 rad/s counter clockwise when viewed from stern.

[9]

