Total No. of Questions : 4]

SEAT No. :

P5202

[Total No. of Pages : 2

[6188]-155

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 Q.1 or Q.2, Q.3 or Q.4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data wherever necessary.***

Q1) a) What is meant by primary and secondary balancing of reciprocating masses? **[6]**

b) A rotating shaft carries four disturbing masses 20 kg, 16 kg, 18 kg and 14 kg at radii 60 mm, 70 mm, 80 mm and 70 mm respectively. The masses m_2, m_3 and m_4 revolve in planes 80 mm, 160 mm and 280 mm from plane of m_1 and located at 60^0, 135^0 and 270^0 respectively measured in counter clockwise direction from m_1. If shaft is dynamically balanced by two masses, both located at 50 mm radii and located midway between m_1 & m_2; and midway between m_3 & m_4. Determine magnitude and angular position of balancing masses. **[9]**

OR

Q2) a) Explain the method of direct and reverse cranks to determine the unbalance forces in radial engines. **[6]**

b) A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100^o and that between the masses at B and A is 190^o, both being measured in the same direction. The axial distance' between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, **[9]**

determine:

i) The magnitude of the masses at A and D
ii) The distance between planes A and D
iii) The angular position of the mass at D

P.T.O.

Q3) a) Explain the effect of gyroscopic couple on two wheeler. **[7]**

b) An areoplane makes a complete half circle of 90 m radius, towards right when flying at 400 km/hr. The rotating engine and the propeller of the plane have a mass 500 kg with a radius of gyration of 40 cm. The engine rotates at 3000 rpm in anticlockwise direction when viewed from the front end. Find the gyroscopic couple on plane and state its effect on it. **[8]**

OR

Q4) a) Derive from the first principles an expression for the gyroscopic couple. **[6]**

b) A ship is propelled by a turbine rotor having a mass of 500 kg and speed of 2100 rpm. The rotor has radius of gyration of 500 mm and rotates in clockwise direction when viewed from the stern. Determine gyroscopic couple and its effect in following conditions: **[9]**

i) The ship takes left turn at radius of 300 m at speed of 30 km/hr.

ii) The ship pitches 6^0 above and 6^0 below the horizontal position. The bow is descending with maximum velocity. The pitching motion is simple harmonic with a periodic time of 20 sec.

iii) The ship rolls and at certain instant it has angular velocity of 0.03 rad/sec clockwise when viewed from stern.

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