

B.TECH SEM – VII (2007 COURSE) (MECHANICAL ENGG.) :
WINTER - 2017

SUBJECT : DYNAMICS OF MACHINERY

Day : **Friday**
Date : **12/01/2018**

W-2017-2595

Time **02.30 PM TO 05.30 PM**
Max. Marks : **80**

N.B.

- 1) **Q.1** and **Q.5** are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from Section – I and Section – II.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non programmable calculator is allowed.
- 4) Answers to both the sections should be written in **SEPARATE** answer book.

SECTION – I

- Q.1** a) Explain the method of balancing reciprocating masses in radial engine. **(05)**
b) Explain the meaning of governor effort and governor power. **(05)**
c) What is the effect of gyroscopic couple on swinging table fan? **(04)**
- Q.2** Each arm of porter governor is 210 mm long and hinged at 40 mm distance from the axis of rotation. The sleeve begins to rise at 260 rpm, when links are at 30° to the vertical. Masses at each ball are 1.5 kg and that of sleeve is 25 kg. Assuming friction that force is constant, find maximum and minimum speeds of rotation when inclination of the arms to the vertical is 45°. **(13)**
- Q.3** An airplane is flying at 220 km/hr. The mass of rotary engine and propeller is 510 kg and it has radius of gyration of 260 mm. The engine speed is 2200 rpm, clockwise as seen from the tail. **(13)**
If the airplane takes turn towards left and completes a quarter circle of 50 m radius, determine gyroscopic couple on the airplane and explain its effect with neat diagram.
- Q.4** The firing order of a six cylinder vertical four stroke in line engine is 1 4 2 6 3 5. The piston stroke is 80 mm and length of each connecting rod is 180 mm. The pitch distances between cylinder centerlines are 80 mm, 80 mm, 120 mm, 80 mm, and 80 mm respectively. Reciprocating mass per cylinder is 1.2 kg and engine speed is 2400 rpm. Determine the out of balance primary and secondary forces and couples on the engine taking the plane midway between cylinder 3 and 4 as the reference plane. **(13)**

SECTION – II

- Q.5** a) Derive an expression for 'Half Frequency Whirl'. **(05)**
b) Explain over damped, critically damped and under damped systems. **(05)**
c) Write short note on vibration monitoring of machines. **(04)**
- Q.6** A machine weighs 18 kg and is supported on springs and dashpot. The equivalent stiffness of springs is 12 N/mm and damping is 0.2 N-sec/mm. The system is initially at rest. Velocity of 120 mm/sec is imparted to the mass. Find : **(13)**
i) Displacement and velocity of the mass of function of time.
ii) Displacement and velocity after 0.4 sec.
- Q.7** In a single degree of freedom damped vibrating system, a mass of 16 kg makes 47 oscillations in 27 seconds. The amplitude of vibration decreases to one fourth of initial value after 5 oscillations. Determine : **(13)**
i) Logarithmic Decrement
ii) Damping factor and Damping coefficient
iii) The stiffness of spring.
- Q.8** a) What do you understand by secondary critical speed in case of horizontal shafts? **(04)**
b) Explain Holzer method used for multi-rotor system. **(09)**

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