



## PART – B

- 5 a. Explain briefly static balance and dynamic balance as applied to revolving masses in different planes. (04 Marks)
- b. Four masses of magnitude 5, 6 M and 8kg revolve in planes A, B, C and D respectively. The planes B, C, D are placed at a distance 0.3m, 1.2m and 2.0m respectively from A. The masses are at same radii of 0.3m. Find the magnitude of M and relative angular position of all masses for complete balance. (16 Marks)
- 6 a. What are In-line engines? State how they are balanced. (06 Marks)
- b. The Pistons of a 4 cylinder vertical engine reach their uppermost position at  $90^\circ$  interval in order of their axial position. Pitch of cylinder = 0.35m, crank radius = 0.12m, length of connecting rod = 0.42m. The engine runs at 600 rpm. If the reciprocating parts of each engine has a mass of 2.5kg, find the unbalanced primary and secondary forces and couples. Take central plane of engine as reference plane. (14 Marks)
- 7 a. Explain the following terms with respect to governor:
- Sensitiveness
  - Governor effort
  - Governor power
  - Hunting
  - Stability
  - Isochronous.
- (06 Marks)
- b. The radius of rotation of the balls of a hartnell governor is 8cm at the minimum speed of 300rpm. Neglecting gravity effect determine the speed after the sleeve is lifted by 6cm, also determine the initial compression of the spring, governor effort and power. The particulars of the governor are, length of ball arm = 15cm, length of sleeve arm = 10cm, mass of each ball = 4kg and stiffness = 25000 N/m. (14 Marks)
- 8 a. Describe the effect of the gyroscopic couple on an aero plane for the following cases, with vector diagram: (12 Marks)

Case no.	Viewing from	Direction of rotation of propeller	Turn of the aero plane towards
1	Nose	Clock wise	Left
2	Nose	Counter clock wise	Left
3	Nose	Clock wise	Right
4	Nose	Counter clockwise	Right

- b. Each road wheel of a motor cycle has a moment of inertia of  $2\text{kgm}^2$ . The rotating parts of the engine of the motor cycle has a moment of inertia of  $0.2\text{kgm}^2$ . The speed of the engine is 5 times the speed of the wheel and is in the same sense. The mass of the motor cycle with rider is 200kg and its CG is 500mm above ground level. The diameter of the wheel is 500mm. The motor cycle is travelling at 15m/sec. on a curve of 30m radius. Determine: i) Gyro couple, centrifugal couple, overturning and balancing couple in terms of angle of heel and ii) Angle of heel. (08 Marks)

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