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**E – 2994**

Reg. No. : .....

Name : .....

# Sixth Semester B.Tech. Degree Examination, June 2018
## (2008 Scheme)
## 08.602 : DYNAMICS OF MACHINERY (MP)

Time : 3 Hours  Max. Marks : 100

***Instructions*** : *1) Answer **all** questions from Part – **A**.*
*2) Answer **one full** question **each** from Module **I, II, III** of Part – B.*

PART – A

1. Briefly describe the equilibrium condition of a four-force member in static force analysis.

2. Discuss about 'the equivalent offset inertia force', in dynamic force analysis.

3. Derive a relationship between 'the coefficient of flucation of speed' and 'the maximum flucation of energy' for the analysis of a flywheel.

4. Derive a relation for the turning moment at the crankshaft in terms of piston effort and the angle turned by the crank.

5. What are centrifugal governors ? How do they differ from inertia governors ?

6. Explain in what way the gyroscopic couple affects the motion of an aircraft while taking a turn.

7. Two masses in different planes are necessary to rectify the dynamic unbalance. Comment.

8. What are frees damped and forced vibrations ? Explain briefly.

9. What do you mean by whirling of shafts ? What is critical speed ?

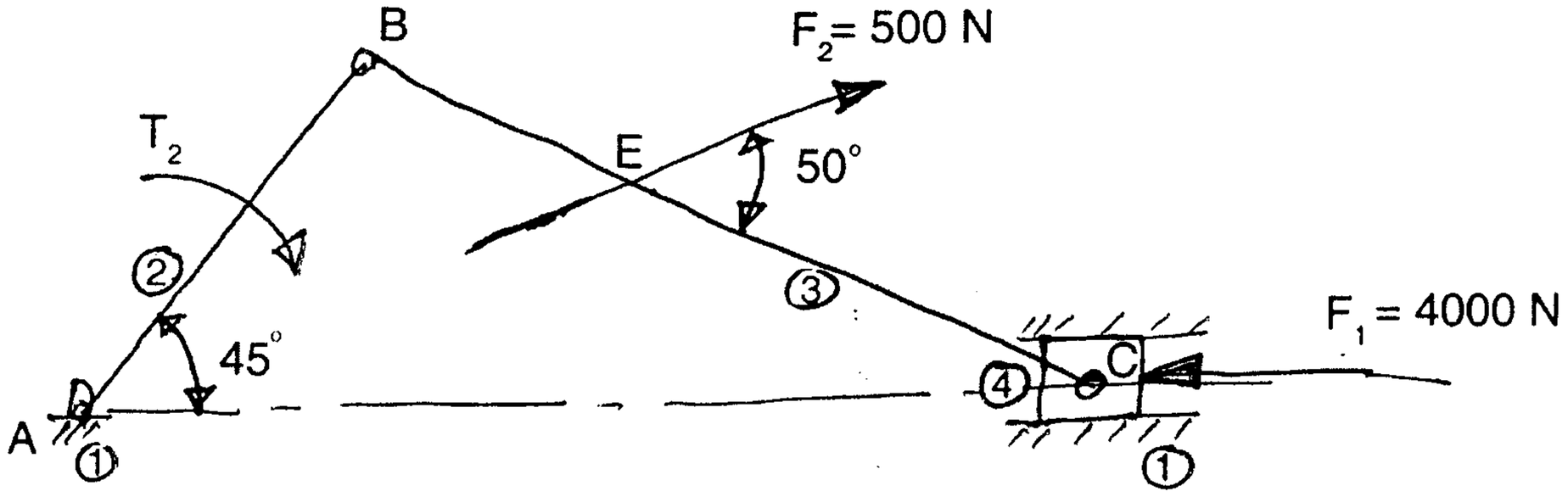
10. Find the ratio of amplitudes of rotors of torsional vibrations of a two-rotor system. **(10×4=40 Marks)**

P.T.O.

PART – B

## Module – I

11. Determine the couple $T_2$ as applied in the figure given below. **20**




AB = 30 cm, BC = 45.5 cm; BE = 17.5 cm.

OR

12. The crank and connecting rod of a vertical petrol engine, running at 1800 rpm are 60 mm and 270 mm respectively. The diameter of the piston is 100 mm and the mass of the reciprocating parts is 1.2 kg. During the expansion stroke when the crank has turned 20° from the top dead centre, the gas pressure is 650 kN/m². Determine the

    i) Net force on the piston.

    ii) Net load on the gudgeon pin.

    iii) Thrust on the cylinder walls.

    iv) Speed at which the gudgeon pin load is reversed in direction. **20**

## Module – II

13. Each arm of a porter governor is 250 mm long. The upper and lower arms are pivoted to links of 40 mm and 50 mm respectively from the axis of rotation. Each ball has a mass of 5 kg and the sleeve mass is 50 kg. The force of friction on the sleeve of the mechanism is 40 N. Determine the range of speed of the governor for extreme radii of rotation of 125 mm and 150 mm. **20**

OR

14. A shaft carries four rotating masses A, B, C and D in this order along its axis. The mass A may be assumed concentrated at a radius of 12 cm, B at 15 cm, C at 14 cm and D at 18 cm. The masses of A, C and D are 15 kg, 10 kg and 8 kg respectively. The planes of revolution of A and B are 15 cm apart and of B and C are 18 cm apart. The angle between A and C is 90°. If the shaft is in complete dynamic balance, determine.

    i) The angle between the radii of A, B and D

    ii) The distance between the planes of revolution of C and D and

    iii) The mass B. **20**

## Module – III

15. Determine the natural frequencies of the torsional vibration of the following system. The system is a reciprocating I.C. engine coupled to a centrifugal pump through a pair of gears. The shaft from the flywheel of the engine to the gear wheel is of 60 mm diameter and 950 mm length. The shaft from the pinion to the pump is of 40 mm diameter and 300 mm length. The engine speed is $1/4^{th}$ of the pump speed.

    Moment of inertia of the flywheel = 800 kg.m$^2$

    Moment of inertia of the gear wheel = 15 kg.m$^2$

    Moment of inertia of the pinion = 4 kg.m$^2$

    Moment of inertia of the pump = 17 kg.m$^2$

    Modulus of rigidity of the shaft material = 84 GN/m$^2$ **20**

OR

16. Explain in detail with proper sketches :

    i) Vibrometers.

    ii) Accelerometer. **20**