ROLL NO: ……
NAME : …….

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, MAY 2016
(2013 Scheme)
13.602 DYNAMICS OF MACHINERY (MP)

Time: 3 Hours **Marks: 100**

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PART-A
(***Answer all questions; each question carries 2 marks***)

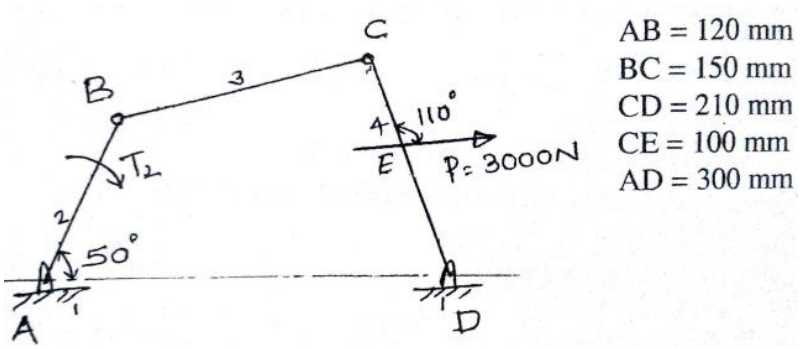
1. How does sliding friction affect static force analysis of a slider?
2. State and explain D'Alemberts principle.
3. What is meant by angle of heel in case of moving motor cycle taking turn? How is it determined?
4. What do you mean by height and sleeve of lift of a governor?
5. What is an isochronous governor?
6. What are the conditions to be satisfied for complete balancing of reciprocating engine?
7. What do you mean by direct and reverse crank method of balancing?
8. What do you mean by critical speed of a shaft?
9. Explain vibration isolation and transmissility.
10. What do you mean by torsionally equivalent shaft? Write the expression for its length.

(10x2 = 20 marks)

PART-B
(**Answer** ***any one question from each module; each carries 20marks***)

MODULE I

11. Determine couple T_2 for the equilibrium of the system shown below. Also determine various forces.



12. Determine the required input torque on the crank of a slider crank mechanism for the static equilibrium when the applied piston load kN. The length of the crank and the connecting rod are 40 mm and 100 mm respectively and the crank has turned through 45^0 from the inner dead centre.

MODULE II

13. A loaded Porter governor has four links each 250 mm long, two revolving masses each of 3 kg and a central dead weight of mass 20 kg. All the links are attached to respective sleeves at radial distances of 40 mm from the axis of rotation. The masses revolve at a radius of 150 mm at minimum speed and at a radius of 200 mm at maximum speed. Determine the range of speed.

14. The mass of the turbine rotor of a ship is 20 tonnes and has a radius of gyration of 0.60 m. Its speed is 2000 r.p.m. The ship pitches 6° above and 6° below the horizontal position. A complete oscillation takes 30 seconds and the motion is simple harmonic. Determine the following: i) Maximum gyroscopic couple, ii) Maximum angular acceleration of the ship during pitching, and iii) The direction in which the bow will tend to turn when rising, if the rotation of the rotor is clockwise when looking from the left.

MODULE III

15. A shaft is rotating at a uniform speed. Four masses m1, m2, m3 and m4 of magnitudes 300 Kg, 450 kg, 360 kg and 390 kg respectively are attached rigidly to the shaft. The masses are rotating in the same plane. The corresponding radius of rotation are 200 mm, 150mm, 250 mm and 300 mm respectively. The angles made by, these masses with horizontal are 0^0,45^0,$l20^0$ and 255^0 respectively. i) Find the magnitude of balancing mass and ii) find the position of the balancing mass, if its radius of rotation is 200 mm .

16. Three cylinders of an air compressor have their axis at 120^0 to one another and their connecting rod is coupled to a simple crank. The stroke is l0 cm and the length of each connecting rod is 1 5 cm. Mass of the reciprocating part per cylinder is 1 .5 Kg. Determine the primary and secondary forces of engine running at 3000 rpm.

MODULE IV

17. A machine weighs 18kg and is supported on springs and dashpots. The total stiffness o the springs is 12 N/mm and the damping is 0.2 Ns/mm. The system is initially at rest and a velocity of 120 mm/s is imparted to the mass . Determine the
    i) Displacement and velocity of mass as a function of time.
    ii) Displacement and velocity after 0.4 sec.

18. A single cylinder oil engine drives directly a centrifugal Pump . The rotating mass of the engine , the flywheel and the pump with the shaft is equivalent to a 3 rotor system as shown in the figure. The mass MI of the rotors A,B and C are 0.15,0.3 and 0.09 kg-m^2 . Find the natural frequency of the torsional vibration and position of the nodes . The modulus of rigidity for the shaft material is 84 KN/m^2.