

**B.TECH. DEGREE EXAMINATION, MAY 2014**

**Sixth Semester**

Automobile Engineering/Mechanical Engineering

AU 010 601/ME 010 601—MECHANICS OF MACHINES (AU, ME)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

**Part A**

*Answer all questions.*

*Each question carries 3 marks.*

1. Explain D'Alembert's Principle.
2. What are the different types of governors ?
3. Explain the function of a flywheel.
4. Explain pitching, rolling, and yawing of naval ships with neat diagrams.
5. Explain different types of brakes.



(5 × 3 = 15 marks)

**Part B**

*Answer all questions.*

*Each question carries 5 marks.*

6. Explain the method of virtual work with an example.
7. What are spring controlled governors ? Describe the function of any one of them.
8. What do you mean by dynamical equivalent system ? Explain.
9. Explain the gyroscopic effect on a two wheeled vehicle.
10. What are the different types of dynamometers ? Explain.

(5 × 5 = 25 marks)

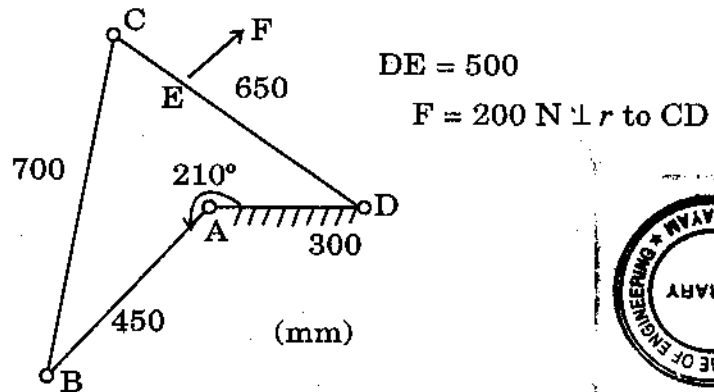
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## Part C

Answer all questions.

Each question carries 12 marks.

11. Find the torque required to be applied to link AB of the linkage shown in figure to maintain static equilibrium.



Or

12. A Connecting rod is suspended from a point 25 mm above the centre of small end and 650 mm above its C.G. Its mass being 37.5 kg, and the time period of oscillation is 1.87 seconds. Obtain the dynamical equivalent system consisting of two masses one of which is located in the small end centre.
13. A Porter governor has two balls each of mass 3 kg and a central load of mass 15 kg. The arms are 200 mm long pivoted on the axis of the max. and min. radii of rotation of the balls are 160 mm and 120 mm respectively, find the range of speed.

Or

14. A Proell governor has all the four arms of length 250 mm. The upper and lower ends of the arms are pivoted on the axis of rotation of the governor. The extension arms of the lower links are each 100 mm long and parallel to the axis when the radius of the ball path is 150 mm. The mass of each ball is 4.5 kg and the mass of the central load is 36 kg. Determine the equilibrium speed of the governor.



15. An engine flywheel has a mass of 6.5 tonnes, and radius of gyration is 2 m. If the max. and min. speeds are 120 r.p.m. and 118 r.p.m. respectively, find maximum fluctuation of energy.

Or

16. A single cylinder double acting steam engine develops 150 kW at a mean speed of 80 r.p.m. The coefficient of fluctuation of energy is 0.1 and the fluctuation of speed is  $\pm 2\%$  of mean speed. The mean dia of flywheel rim is 2m and the hub and spokes provide 5% of the rotational inertia of the flywheel. Find the mass, cross sectional area of the flywheel rim. Take density of the material as  $7200 \text{ kg/m}^3$ .
17. A flywheel with mass 20 kg, radius of gyration 300 mm is spinning at 500 r.p.m. about a horizontal axis. The flywheel is suspended at a point 250 mm from the plane of rotation of the flywheel. Find the rate of precession of the flywheel.

Or

18. A turbine rotates at 1200 r.p.m. CW when looking from the stern. The sea vessel pitches at 1.2 rad/sec. Find out the gyroscopic couple transmitted to the hull when the bow rises? Mass of rotor = 950 kg and radius of gyration is 300 mm.
19. A torsional dynamometer is fitted on a turbine shaft to measure the angle of twist. The shaft twists  $1.5^\circ$  in a length of 5 meters at 500 r.p.m. The shaft is solid and has a dia of 200 mm. Find the power transmitted by the turbine. Take  $G = 85 \text{ GPa}$ .

Or

20. A Car moving with 36 km/hr. on a level road, has its C.G. lying 0.6 m above the ground level, wheel has 2.4 m, and the distance of C.G. from rear wheel is 0.9 m. Find the distance travelled by the car before causing to rest when brakes are applied to all the four wheels  $\mu = 0.45$ .

(5 × 12 = 60 marks)