| **Paper Code: EME-603** | **Roll No.** | | | | | | | | | | |
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**B. TECH.**
**(SEM VI) Back Paper EXAMINATION, 2015-2016**
**THEORY OF MACHINES-II**

**[Time: 2 hrs.]** **[Max. Marks: 50]**

**Note:** Attempt total four questions. *Q.No. 1 is compulsory* and attempt any three others**.**

**Q. 1.** Attempt all three parts of the following: - **[4+8+8]**

(a) Explain the principle of VIRTUAL WORK and principle of SUPERPOSITION OF FORCES.

(b) Connecting rod of an engine weighs 70 kg. Its length is 100cm with C.G. 60cm from the little end. Radius of gyration of the connecting Nod is 30cm about an axis through its C.G. The length of crank is 22.5 cm and it revolves at 270 rpm. Determine the magnitude, direction and line of application of the inertia force of connecting rod, when crank makes an angle of 30$^o$ from I.D.C.

(c) A four stroke single cylinder gas engine develops 18.5 KW power at 300 rpm. Work done during power stroke is three times the work done on gases during compression stroke; work done during suction and exhaust stroke being nil. If the total fluctuation of speed is not to exceed ±2% of mean speed and if the turning moment diagram during power stroke is assumed to be triangular in shape, find the moment of inertia of the fly wheel.

**Q.2.** A single cylinder engine running at 250 rpm has a stroke of 180 mm. Weight of reciprocating parts is 120kg and revolving parts are equivalent to the mass of 70kg at a radius of 90mm. A mass is placed on the opposite side of the crank at a radius of 150mm to balance whole of revolving and two-third of reciprocating mass. Determine the magnitude of balancing mass and residual unbalance force when crank has turned 30$^o$ from IDC. Neglect obliquity of connecting rod. **[10]**

**Q.3.** A mass attached to a spring of stiffness 6 N/cm has viscous damping device. When the mass is displaced and released, it vibrates with time period of 1.8sec, and the ratio of consecutive amplitudes is 4:2:1. **[10]**

**Q.4.** Draw a neat and labeled sketch of a WILSON-HARTNELL governor. Then derive an expression for the spring stiffness of the auxiliary spring. **[10]**

**Q.5.** A ship is pitching through a total angle of 15$^o$; the oscillation may be taken as simple harmonc. Time period of oscillation is 32 seconds. The turbine rotor of the ship has a mass of 6 tonnes and a radius of gyration of 450 mm. The rotor has a rpm of 2400. Calculate the maximum value of gyroscopic couple set up by the rotor and indicate its effect. Also find the maximum angular acceleration of ship when pitching. (Assume missing data, if any) **[10]**