

**DIPLOMA IN MECHANICAL ENGINEERING  
(DME) / ADVANCED LEVEL CERTIFICATE  
COURSE IN MECHANICAL ENGINEERING  
(DMEVI / ACMEVI)**

**Term-End Examination**

**December, 2015**

**BME-033 : HEAT POWER TECHNOLOGY**

*Time : 2 hours*

*Maximum Marks : 70*

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*Note : Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is allowed.*

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1. In a belt transmission dynamometer, the driving pulley rotates at 300 rpm. The distance between the centre of the driving pulley and the dead mass is 800 mm. The diameter of each of the driving as well as the intermediate pulleys is equal to 360 mm. Find the value of the dead mass required to maintain the lever in a horizontal position when the power transmitted is 3 kW. Also find its value when the belt just begins to slip on the driving pulley,  $\mu$  being 0.25 and the maximum tension in the belt 1200 N. 14

2. A machine is coupled to a two-stroke engine which produces a torque of  $(800 + 180 \sin 3\theta)$  Nm, where  $\theta$  is the crank angle. The mean engine speed is 400 rpm. The flywheel and the other rotating parts attached to the engine have a mass of 350 kg at a radius of gyration of 320 mm. Calculate :
- (i) The power of the engine,
  - (ii) Total fluctuation of speed of the flywheel when the resisting torque is constant. 14
3. (a) Describe a battery ignition system with the help of a sketch. 7
- (b) What do you understand by the energy requirements of the ignition system ? 7
4. A belt drive is required to transmit 10 kW from a motor running at 600 rpm. The belt is 12 mm thick and has a mass density of  $0.001 \text{ gm/mm}^3$ . Safe stress in the belt is not to exceed  $2.5 \text{ N/mm}^2$ . Diameter of the driving pulley is 250 mm whereas the speed of the driven pulley is 220 rpm. The two shafts are 1.25 m apart. The coefficient of friction is 0.25. Determine the width of the belt. 14

5. (a) What are the various methods for measuring friction power ? Describe the 'motoring' method of measurement of friction power and comment on its accuracy. 7
- (b) Describe with a sketch the principle of eddy current dynamometer. 7
6. In an ideal Otto-cycle, the air at the beginning of isentropic compression is at 1 bar and 15°C. The ratio of compression is 8. If the heat added during the constant volume process is 1000 kJ/kg. Determine :
- (a) the maximum temperature in the cycle,  
 (b) the air standard efficiency,  
 (c) the work done per kg of air, and  
 (d) the heat rejected.
- (Take  $C_v = 0.718$  and  $\gamma = 1.4$ ) 14
7. Write short notes on the following : 2×7=14
- (i) Quantitative Governing  
 (ii) Dual Combustion Engine
8. (a) Compare the advantages and disadvantages of four-stroke and two-stroke cycle engines. 7
- (b) Define and explain the term Knock in SI engines. 7