

# Question Paper 2011

## Mechanical Engineering (Paper II)

1. (a) The gas in a system receives heat which causes expansion against a constant pressure of 2 bar. An agitator in the system is driven by an electric motor using 100 W. For 4 kJ of heat supplied the volume increase of the system in 30 sec is  $0.06 \text{ m}^3$ . Estimate net change in the energy of the system. (15)  
(b) Find the coefficient of performance and heat transfer rate in the condenser of a refrigerator in kJ/h which has a refrigeration capacity of 12000 kJ/h when power input is 0.75 kW. (15)
2. (a) What is Air standard cycle? Define, Air standard efficiency and, mention the assumptions involved with Air standard cycle. (15)  
(b) Explain the purpose of Cooling system in IC engines. Also mention different types of Cooling systems in brief. (15)
3. (a) What is the principle on which manometer works? Also explain its various types, with their use in brief. (15)  
(b) What is Bernoulli's Theorem? Also mention its assumptions.  
The diameter of a pipe at the section 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/sec. Determine the velocity at section 2. (15)
4. (a) A thick cylinder 125 mm inside diameter and 250 mm outside diameter is subjected to an internal fluid pressure of  $50 \text{ N/mm}^2$ . Determine the maximum and minimum intensities of circumferential stress and sketch the distribution of circumferential stress intensity and radial pressure intensity across the section. (15)  
(b) Determine the maximum torque that can be safely applied to a shaft of 200 mm diameter if the permissible angle of twist is  $1^\circ$  for a length of 5 m and the permissible shear stress is  $45 \text{ N/mm}^2$ . Take Modulus of Rigidity =  $0.8 \times 10^5 \text{ N/mm}^2$ . (15)
5. (a) Explain Tempering process and its classification (Austempering/Isothermal quenching and Martempering/Stepped quenching). (15)  
(b) With the help of neat sketch describe arc welding with coated electrode in detail. (15)
6. (a) The total tension on the two sides of a belt connecting two pulleys is 2 kN. The minimum angle of embrace of the belt is  $150^\circ$  and coefficient of friction between the belt and the pulley rim is 0.25. Determine the value of the tension on both the tight and the slack side of the belt. Also calculate the power transmitted if the speed of the belt is 600 m/minute. (15)  
(b) Draw roller follower – cam mechanism and describe the terminology  
(i) base circle  
(ii) pitch curve  
(iii) prime circle  
(iv) pressure angle and pitch point. (15)