

**II B.Tech II Semester Supplementary Examinations,  
November/December 2005  
THERMAL ENGINEERING & HEAT TRANSFER  
( Common to Mechatronics and Production Engineering)**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions  
All Questions carry equal marks**

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1. (a) Define
  - i. bore and stroke
  - ii. displacement and clearance volume.
 (b) Discuss the merits and demerits of 2 stroke engines over 4 stroke engines. [8+8]
2. What are the different kinds of fuels used in an IC engine? Discuss them in detail. [16]
3. (a) What are the various characteristics of an efficient cooling systems?  
 (b) Explain with the help of sketches
  - i. Thermosyphon cooling system
  - ii. Pressure cooling system. [6+10]
4. (a) What do you understand by solid injection? What are its advantages over air-injection system?  
 (b) Draw a schematic diagram of Bosch type fuel pump and explain its working. [8+8]
5. (a) "Closed cycle gas turbine plants are akin to steam turbine plants" . Comment.  
 (b) Derive the expression for efficiency and specific work output for a simple gas turbine cycle in terms of pressure ratio. [6+10]
6. Prove that the heat loss per square metre of outside surface area of a hollow sphere heated from within is equal to

$$q = \frac{2k(T_1 - T_2)}{(D_2 - D_1) \frac{D_2}{D_1}}$$

where  $T_1$  and  $T_2$  are the temperatures and  $D_1$  and  $D_2$  are the diameters of the inner and outer surfaces respectively. [16]

7. (a) Define Nusselt and Prandtl numbers. Explain their importance in convection heat transfer.  
 (b) A vertical pipe 5 cm diameter carrying hot water is exposed to ambient air at  $15^\circ\text{C}$ . If the outer surface of the pipe is  $65^\circ\text{C}$ , find the heat loss from one metre height of the pipe per hour. [8+8]

8. (a) Explain the difference between the monochromatic emissive power and total emissive power of a black body.
- (b) A small oven measures  $0.4\text{m} \times 0.5\text{m} \times 0.3\text{ m}$ . The floor of the oven receives radiation from all the walls and roof which are at  $300^{\circ}\text{C}$  having an emissivity of 0.8. The floor is maintained at  $150^{\circ}\text{C}$  and has an emissivity of 0.6. Calculate the radiation exchange. [6+10]

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