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Total Number of Pages: 02

**B.TECH**  
**PBE2B103**

**2<sup>nd</sup> Semester Regular Examination 2016-17**  
**BASICS OF MECHANICAL ENGINEERING**

**BRANCH: ALL**

**Time: 3 Hours**

**Max Marks: 100**

**Q.CODE: Z589**

**Answer Part-A which is compulsory and any four from Part-B.**  
**The figures in the right hand margin indicate marks. Steam tables are allowed in the examination hall.**

**Part – A (Answer all the questions)**

- Q1 Answer the following questions: *multiple type or dash fill up type* (2 x 10)**
- a) A paddle wheel is harnessed to agitate a mass of liquid in a tank. And in that process 5kJ of mechanical work is supplied and the system loses 1.5 kJ of heat to its surroundings. Therefore the change in internal energy associated with the process is \_\_\_\_\_.
  - b) A reversible engine operating between two temperature reservoirs of heat , 600K and 300K absorbs 300 kW of heat and rejects Q2 the heat sink. The value of Q2 is\_\_\_\_\_.
  - c) The pressure and temperature at the critical state point (water-steam) are\_\_\_\_\_,\_\_\_\_\_.
  - d) The density of air at pressure of 1 bar and temperature of 298 K is \_\_\_\_\_.
  - e) The corresponding height of mercury column for 0.2 MPa pressure is\_\_\_\_\_.
  - f) What does good impact strength indicate?  
(i) Good creep resistance (ii) Good wear resistance  
(ii) Good ductility (iv) Good fatigue strength
  - g) Which of the following is a permanent fastening  
(i) Screw (ii) Rivet (iii) Bolt (iv) Key
  - h) Which gear train mechanism is used to connect minute hand to hour hand in a clock mechanism  
(i) Simple (ii) Compound (iii) Reverted (iv) Epicyclic
  - i) Which of the following is used to measure discharge in a fluid flow  
(i) Pitot tube (ii) Manometer (iii) Venturimeter (iv) Dynamometer
  - j) Extrusion is a  
(i) Forming process (ii) casting process (iii) forging process  
(iv) none of the above
- Q2 Answer the following questions: *Short answer type* (2 x 10)**
- a) Determine the absolute pressure (in bar) of a fluid flowing in a pipe line if the manometer reads 200 mm of Hg. The atmospheric pressure is 760 mm Hg.

- b) Write down four casting defects.  
 c) Differentiate between Dynamic viscosity and Kinematic viscosity.  
 d) Differentiate between intensive and extensive properties  
 e) State Clausius law of inequality.  
 f) Differentiate between Dynamic viscosity and Kinematic viscosity.  
 g) Classify the hydraulic turbines.  
 h) Classify welding processes.  
 i) Classify heat exchangers used in industries.  
 j) Find enthalpy, volume and entropy of steam at 10 bar, 200°C.
- Part – B (Answer any four questions)
- Q3** a) Two kg of a gas enclosed in a cylinder-piston assembly undergo three specific processes of volume expansion:  $P_1= 6 \text{ bar}$ ,  $V_1=0.2\text{m}^3 \rightarrow P_2=2 \text{ bar}$ ,  $V_2=0.6\text{m}^3$  **(10)**  
 Determine the work done in each case,  
 (i) P varies as linear function of V (ii)  $PV=\text{Constant}$  (iii) P remains constant till the volume reaches  $0.3 \text{ m}^3$  and  $PV^n=\text{constant}$  after that.
- b) Define the following, (i)  $C_p$  (ii)  $C_v$  (iii) H **(5)**
- Q4** a) A centrifugal air compressor delivers 900 kg/h of air. Compute 1. The motor power required to drive the compressor 2. The ratio of inlet to outlet pipe diameter. **(10)**  
 Given  
 Air velocity at inlet: 5m/s, Air velocity at the outlet: 7.5 m/s, Enthalpy of the compressed air: 20 kJ/kg, Specific volume of the inlet air: 0.5 m<sup>3</sup>/kg,  
 Specific volume of the outlet air: 0.15 m<sup>3</sup>/kg, Heat lost: 75.6 kJ/s.
- b) Derive mass continuity and SFEE equation for the flow systems. **(5)**
- Q5** a) Two reversible heat engines A and B are arranged in such a manner that Engine A rejecting heat directly to Engine B. Engine A receives 300 kJ at a temperature of 620 C from a hot source while Engine B is in communication with sink at a temperature of 4 C. If the work output of A is twice that of B, find (a) the intermediate temperature between A and B (b) the efficiency of each engine (c) the heat rejected to the cold sink. **(10)**
- b) Write down the 1st law and 2nd law of thermodynamics. Mention key differences. **(5)**
- Q6** a) Water at 40C is continuously sprayed into a pipe carrying 6000 kg/hour of steam at 5 bar, 300 C. At a section downstream where the pressure of the steam is 3 bar and quality is 90%. Find the rate of water spray in kg/h. **(10)**
- b) Draw the p-v, T-s and h-s plot of pure substance (water- steam). **(5)**
- Q7** a) Briefly explain different properties of engineering materials which are required to know before manufacturing an engineering component. **(10)**
- b) Mention different modes of heat transfer with corresponding equations involved. **(5)**
- Q8** a) With schematic layout, describe different turning operations carried out in lathe machine. **(10)**
- b) Explain in detail with diagram the spur gear and its application **(5)**
- Q9** a) With neat sketch, explain working of the refrigerator and a heat pump. **(10)**
- b) Explain the working of Pitot tube with a sketch. **(5)**