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B.Tech.
PBE2B103

2ⁿᵈ Semester Regular / Back Examination 2017-18
BASICS OF MECHANICAL ENGINEERING
BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FAT, IEE, IT, MANUFAC, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE

Time : 3 Hours
Max Marks : 100
Q.CODE : C924
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1 Answer the following questions: *multiple type or dash fill up type* **(2 x 10)**

a) --------- law of thermodynamics tell about the law of entropy.

b) A series of state changes such that the final state is identical with initial state is known as-------------.

c) A device which increases the velocity of a fluid at the expenses of its pressure drop is known as ----------------.

d) The pressure at a point in a static fluid is equal in all direction is known as -------------------.

e) A device which operating in a cycle, maintains a body at a temperature lower than the temperature of the surrounding is known as -----------.

f) Spark plug usually used in -------------- engine.

g) The unit of dynamic viscosity is ------------.

h) ---------- casting is best for parts that are too complicated for other casting methods.

i) Dynamometer is a transducer used to measure-------------.

j) When austenite is oil cooled, it produces---------------.

Q2 Answer the following questions: *Short answer type:* **(2 x 10)**

a) What is the difference between macroscopic and microscopic approach?

b) Explain zeroth law of thermodynamics with example.

c) Distinguish between flow work and displacement work.

d) What is meant by PMM2 and why it is not possible?

e) Define critical point and triple point.

f) What is the difference between isentropic process and adiabatic process?

g) What is Bernoulli's equation? List the assumptions which are made while deriving Bernoulli's equation.

h) Define yield strength. What is its importance?

i) What are the advantages of die casting process over sand casting?

j) What do you mean by gear train?

Part – B (Answer any four questions)

Q3 a) 680 kg of fish at 5^0C are to be frozen and stored at -12^0C.The specific heat of fish above freezing point is 3.182 and below freezing point is 1.717 kJ/kg. The freezing point is -2^0C, and the latent heat of fusion is 234.5 kJ/kg. How much heat must be removed to cool the fish, and what percent of this is latent heat? **(10)**

b) A mass of 8 kg expands within a flexible container so that the p-v relationship is of the form $pv^{1.2}$ = constant. The initial pressure is 1000 kPa and the initial volume is 1m^3. The final pressure is 5 kPa. If specific internal energy of the gas decreases by 40 kJ/kg, find the heat transfer in magnitude and direction. **(5)**

Q4 a) Air at a temperature of 15 ^{0}C passes through a heat exchanger at a velocity of 30 m/s where its temperature is raised to 800 ^{0}C.It then enters a turbine with the same velocity of 30 m/s and expands until the temperature falls to 650 ^{0}C. On leaving turbine, the air is taken at a velocity of 60 m/s to a nozzle where it expands until the temperature is fallen to 500 ^{0}C. If the air flow rate is 2 kg/s, calculate (a) the rate of heat transfer to the air in the heat exchanger, (b) the power output from the turbine assuming no heat loss, and (c) the velocity at exit from the nozzle, assuming no heat loss. Take the enthalpy of air as h = c_p t, where c_p is the specific heat equal to 1.005 kJ/kg K and t is the temperature. **(10)**

b) A heat pump working on the Carnot cycle takes in heat from a reservoir at 5 ^{0}C and delivers heat to a reservoir at 60 ^{0}C. The heat pump is driven by a reversible heat engine which takes in heat from a reservoir at 840^{0}C and rejects heat to a reservoir at 60 ^{0}C. The reversible heat engine also drives a machine that absorbs 30 kW. If the heat pump extracts 17 kJ/s from the 5 ^{0}C reservoir, determine (a) the rate of heat supply from the 840^{0}C source, and (b) the rate of heat rejection to the 60 ^{0}C sink. **(5)**

Q5 a) A large insulated vessel is divided into two chambers, one containing 5 kg of dry saturated steam at 0.2 MPa and the other 10 kg of steam, 0.8 quality at 0.5 MPa. If the partition between the chambers is removed and the steam is mixed thoroughly and allowed to settle, find the final pressure, steam quality, and entropy change in the process. **(10)**

b) 0.5 kg of air is compressed reversibly and adiabatically from 80 KPa, 60 ^{0}C to 0.4 MPa, and is than expanded at constant pressure to the original volume. Sketch theses processes on the p-v and t-s planes. Compute the heat transfer and work transfer for the whole path. **(5)**

Q6 a) Explain in detail with line diagram the working of a four stroke petrol engine. **(10)**
b) Explain the working of steam power plant and give its layout. **(5)**

Q7 a) Explain the energy losses due to flow in pipes. **(10)**
b) What do you mean by heat exchanger? Mention types and example of heat exchanger. **(5)**

Q8 a) Discuss about casting defects and their remedies. **(10)**
b) Define extrusion process. Compare extrusion and rolling process. **(5)**

Q9 a) Explain about different gears used to transmit power between parallel shaft. **(10)**
b) Explain working of Pitot tube with sketch. **(5)**