Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

PBE2B103

2nd Semester Back Examination 2018-19

BASICS OF MECHANICAL ENGINEERING

BRANCH : AEIE, AUTO, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, ELECTRICAL, ETC, IEE, IT, MECH, MINERAL, MINING, MME, PE, TEXTILE

Time : 3 Hours

Max Marks : 100

Q.CODE : F716

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.Use of Steam table and Refrigeration table are allowed in the examination hall.

Part- I

Q1 Short Answer Type Questions (Answer All-10) (2 x 10)

a) Convert 40 cm Hg vacuum pressure into pressure in kPa format.

b) What is COP? Relate COP of refrigerator with that of heat pump.

c) Name four mountings used in steam power plant.

d) Find enthalpy, volume and entropy of steam at 50 bar, 300˚C.

e) Briefly explain the method to measure strain on a sheet metal.

f) Why couplings are used in machines?

g) What is thermocouple? On what principle, thermocouple works?

h) Show that work is a path function, not a property.

i) State Clausius law of inequality.

j) What is the use of clutch?

Part- II

Q2 Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

a) Write down the different methodologies of temperature measurement.

b) Show that energy is a property of a system.

c) Explain in detail with diagram the spur gear and its application

d) Differentiate between refrigerator and a heat pump.

e) What is accessories? Sketch and explain any one of it.

f) With a sketch, explain working of one accessories used in steam power plant.

g) What is venturimeter tube? Derive the formula to measure the parameter it is used for.

h) Give a short notes on belt drive system

i) Briefly discuss about the merits and demerits of rope drive and belt drive.

j) With sketch, explain working of fossil fuel based steam power plant.

k) Derive work transfer for isothermal process and adiabatic process assuming air as working fluid and assuming expansion process.

l) Differentiate between Spark ignition engine & Compression ignition engine

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 Specify robot anatomy. Explain joints and links of robot configurations with sketch. **(16)**

Q4 Establish the equivalence of Kelvin-Planck and Clausius statements. **(16)**

A heat pump is to be used to heat a house in winter and then reversed to cool the house in summer. The interior temperature is to be maintained at 20°C. Heat transfer through the walls and roof is estimated to be 500 J/s per degree temperature difference between the inside and outside.

a) If the outside temperature in winter is 5°C what is the minimum power required to drive the heat pump?
b) what is the maximum outer temperature for which the inside can be maintained at 20°C

Q5 Draw h-s diagram for water and indicate the following on the same : **(16)**

a) saturated liquid line
b) saturated vapor line
c) critical point
d) constant pressure line
e) constant temperature line
f) constant quality line

A rigid tank of volume $3m^3$ contains 5 kg of wet steam at a pressure of 200 kPa. The tank is heated until the steam becomes dry saturated. Determine the final pressure, the heat transfer to the tank and entropy change.

Q6 Write down the mass conservation equation and steady flow energy equation for an open system. Explain various terms in it. **(16)**

The stream of air and gasoline vapor in the ratio of 14:1 by mass, enters a gasoline engine at a temperature of 30°C and leaves as a combustion products at a temperature of 790°C. The engine has a specific fuel consumption of 0.3 kg/kWh. The net heat transfer rate from the fuel-air stream to the jacket cooling water and to the surroundings is 35 kW. The shaft power delivered by the engine is 26 kW. Compute the increase in the specific enthalpy of the fuel-air stream, assuming kinetic energy and in elevation to be negligible.