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

Total Number of Pages: 03 **B.TECH**

PBE1B101

1st Semester Regular Examination 2016-17
BASICS OF MECHANICAL ENGINEERING

BRANCH(S): ALL

Time: 3 Hours

Max Marks: 100

Q.CODE: Y675

Answer Part-A which is compulsory and any four from Part-B.

The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 **Answer the following questions: *multiple type*** **(2 x 10)**

a) Ice kept in a well insulated thermoflask is an example of which system?
   i. Closed system
   ii. Isolated system
   iii. Open system
   iv. Non-flow adiabatic system

b) Which of the following quantity is not the property of the system
   i. pressure
   ii. temperature
   iii. density
   iv. heat

c) If the work done on a closed system is 20 kj/kg and 40kj/kg heat is rejected from the system, its internal energy decreased by
   i. 20 kj/kg
   ii. 60 kj/kg
   iii. -20 kj/kg
   iv. -60 kj/kg

d) All the three modes of heat transfer are involved in
   i. Melting of ice
   ii. cooling of a small metal casting in a quenching system.
   iii. Heat flow through walls of a refrigerator.
   iv. automobile engine equipped with a thermosyphon cooling system.

e) Bourdon gauge measures
   i. absolute pressure
   ii. gauge pressure
   iii. local atmospheric pressure
   iv. standard atmospheric pressure

f) The shear stress devloped in a lubricating oil having viscosity 9.81 poise filled between two parallel plates 1 cm apart and moving with relative velocity 2m/sec is
   i. 20 N/m2
   ii. 19.62 N/m2
   iii. 29.62 N/m2
   iv. 40 N/m2

g) The process of joining metal sheet by means of a fusible alloy or metal in molten state is called
   i. brazing
   ii. soldering
   iii. diffusion
   iv. lancing

h) In flange coupling , the weakest element should be
   i. key
   ii. bolt
   iii. shaft
   iv. flange

i) Which of the following casting processes uses a rotating mould?
   i. shell-moulding
   ii. centrifugal casting
   iii. die casting
   iv. Investment die casting

j) Advantages of coated electrode for shielded metal arc welding process is
   i. gives off inert gases and protect the molten weld pool.
   ii. provides arc stabilizing compounds.
   iii. Provides flux to remove oxide from the weld zone.
   iv. all of the above.

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

a) What is PMM1? Explain with a suitable example.

b) Prove that amount of heat transferred in a constant pressure process is change in enthalpy.

c) What do you mean by critical point of a pure substance?

d) Define volumetric efficiency of a compressor. On what factors does it depend?

e) What is equivalent head of mercury corresponding to 30 cm column of kerosene of relative density 0.8.

f) Calculate the angle swiveled by compound rest of a lathe machine during taper turning operation of a job having larger diameter D and smaller diameter d.

g) Three identical pipes of length L, diameter D and friction factor f are connected in series between two reservoirs. Calculate the equivalent length of the pipe having same friction factor f.

h) What do you understand by the designation M33 X 2 of a bolt ?

i) Explain briefly about Slip and creep of a belt in belt drive.

j) Draw a stress-strain diagram for mild steel and mark the distinct points on it.

Part – B (Answer any four questions)

Q3 **a)** A rigid closed tank with volume 3 m^3 contains 5 kg of wet steam at a pressure of 300 kPa. The tank is heated until the steam becomes dry saturated. Determine the final pressure and heat transfer to the tank. **(10)**

b) Differentiate between Newtonian and non-Newtonian fluids with suitable examples. **(5)**

Q4 **a)** Show that adiabatic mixing of two fluids is irreversible. **(10)**

b) A turbo compressor delivers 2.33 m^3/s at 0.276 Mpa, 43°C which is heated at this pressure to 430 $^{\circ}$C and finally expanded adiabatically in a turbine which delivers 1860 kw. Calculate the turbine exhaust temperature if changes in kinetic and potential energy are negligible. **(5)**

Q5 **a)** Two parallel shafts are connected with the help of two gears one gear on each shaft. The number of teeth on one gear is 38 and the speed of the shaft is 420 r.p.m. If the speed ratio is equal to 3 and circular pitch of the gears is 25 mm, then, find : (i) number of teeth and speed of other shaft,(ii) centre distance between two shafts. **(10)**

b) Explain briefly the principle of generation of arc in arc welding and discuss about advantage of DC arc welding over AC arc welding. **(5)**

Q6 **a)** An empty balloon and its equipment weighs 441.45 N. The balloon inflated with gas weighing 5.415 N/m^3. The balloon is spherical and 7m in diameter. What is the maximum weight of the cargo that the balloon can lift, assuming density of air as 1.23 kg/ m^3. **(10)**

b) Differentiate between thermosetting and thermoplastic resins. Give two applications for each. **(5)**

Q7 **a)** Explain the working of a refrigeration cycle with a schematic diagram. Represent the same on T-S diagram. **(10)**

b) What are advantages of AC and DC power supply in arc welding? **(5)**

Q8 **a)** Differentiate between the principle of operation of 4 stroke and two stroke engine. **(10)**

b) Write down mathematically the basic laws being used in conduction, convection and radiation heat transfer problems. **(5)**

Q9 **a)** Discuss about working principles of different flow measuring instruments available and thermometers measuring high temperatures. Discuss with necessary mathematical formulations. **(10)**

b) Differentiate between the types of welding flames found in oxy-acetylene welding with respect to their composition, temperature and the metals to weld. **(5)**