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SUBJECT CODE = MEE022204

Roll No. of candidate

2017

End Semester B.Tech. Examination

1ˢᵗ Semester

BASIC MECHANICAL ENGINEERING

Full Marks- 70   Pass Marks- 21   Time- 3 hours

The figures in the margin indicate full marks.

PART – A

Q.1. Answer all questions: **(16 x 1 = 16)**

    a) What is a thermodynamic system?
    b) Differentiate between extensive and intensive properties of a thermodynamic system.
    c) State the Zeroth law of thermodynamics.
    d) What are the characteristics of laminar flow of fluid?
    e) State the parallel axis theorem.
    f) Define the term: angle of repose.
    g) State the law of a machine.
    h) What is a belt drive?
    i) Name five sources of renewable energy.
    j) What is an energy conversion device?
    h) Draw a schematic diagram of steam power plant and label it.
    k) What is a turbine?
    l) Define the term ductility.
    m) Name three manufacturing processes.
    n) What do you understand by the turning process?
    o) Differentiate between upward and downward milling.
    p) What are non-metallic materials? Give examples.

PART – B

Q.2. Answer all questions: **(4 x 3.5 = 14)**
a) Explain convection heat transfer with a proper example.
b) A shaft running at 200rpm is to drive a parallel shaft at 350rpm. The pulley on the driving shaft is 60 cm diameter. Calculate the diameter of the pulley of the driven shaft (i) neglecting belt thickness (ii) considering belt thickness of 4mm (iii) assuming in the latter case, a total slip of 5%.
c) What are the various methods of solar power generation?
d) Classify the various types of welding processes.

PART – C

Answer the following: **(4 x 10 = 40)**
Q.3. State the Kelvin-Plank statement for second law of thermodynamics. **(1)**
In an air standard diesel cycle, the compression ratio is 16, and at the beginning of isentropic compression, the temperature is 15°C and the pressure is 0.1 MPa. Heat is added until the temperature at the end of the constant pressure process is 1480°C. Calculate (i) cut-off ratio (ii) Heat supplied per kg of air (iii) cycle efficiency. **(3+3+3)**

OR

Explain the Otto cycle with p-v and T-s diagrams. **(5)**
The surface temperature of a central heating radiator is 60°C. What is the net black body radiation heat transfer unit surface area between the radiator and its surroundings at 20°C? **(5)**

Take $\sigma = 5.67 \times \frac{10^{-8}W}{m^2K^4}$.

Q.4. Calculate the moment of Inertia of the given T-section in figure (i) about centroidal x-x axis.
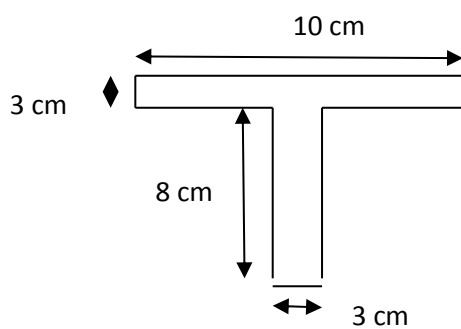

10 cm

3 cm

8 cm

3 cm

Figure (i)

OR

What is a gear train? Explain in detail the various types of gear trains. **(1+3)**
An effort of 80N is applied to a machine to lift a load of 850N. The distance moved by the effort is 100cm. the load is raised to a distance of 10cm. Determine (a) mechanical advantage (b) velocity ratio (c) efficiency. **(2+2+2)**

Q.5

a).What is energy? Differentiate between renewable and non-renewable sources of
energy. **(1+3)**

b).Write short notes on wind and wave energy. **(3+3)**

OR

c) What is a boiler? Explain the basic working principle of a boiler. **(1+4)**

d)With a schematic diagram, enumerate the working principle of a house-hold
refrigerator. **(5)**

Q.6

a).What is casting and what are its advantages? What are the various steps involved in the
process? **(2.5+2.5)**

b).What is forging? Explain the various forging operations with diagram. **(1+4)**

OR

c).Write notes on any two: (i) Drilling,(ii) Grinding,(iii)Surface Finishing. **(2+2+2)**

d).Define with examples the following: (i) Ferrous Materials,(ii) Non-Ferrous materials.
(2+2)