Code No: R161214 **R16** SET -1

I B. Tech II Semester Supplementary Examinations, Nov/Dec - 2018
ELECTRICAL AND MECHANICAL TECHNOLOGY
(Com. to ECE, EIE, ECom E)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) What are the losses that occur in a dc machine? (2M)
   b) What are the drawbacks of synchronous impedance method? (2M)
   c) Draw the torque-slip characteristic of a three-phase induction motor. (2M)
   d) Explain the need for controlling torque in a measuring instrument. (2M)
   e) Differentiate thermodynamics and Heat transfer. (2M)
   f) What is renewable Non-renewable energy? List out various renewable energy sources. (2M)
   g) What do you understand by the term 'interference' as applied to gears? (2M)

PART -B

2. a) With a neat schematic explain the working of a three-point starter. (7M)
   b) A 25 kVA, single-phase transformer has 400 turns on the primary and 100 turns on the secondary. The primary is connected to 1200 V, 50 Hz supply. Determine: (7M)
      (i) the secondary voltage on open circuit.
      (ii) the current flowing through the two windings on full-load.
      (iii) the maximum value of flux.

3. a) Explain the principle of operation of a three-phase alternator. (7M)
   b) A three-phase, 6-pole, 50 Hz induction motor has a slip of 1.5 % at no-load and 4% at full-load. Find: (i) synchronous speed (ii) No-load speed (iii) full-load speed (iv) frequency of rotor current at standstill, and (v) frequency of rotor current at full-load. (7M)

4. a) Explain the operation of an induction type energy meter with the help of a neat sketch. (7M)
   b) With the help of a neat schematic explain the working a permanent magnet moving coil type of instrument. (7M)
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5. a) Derive the general heat conduction equation in Cartesian coordinates. (7M)

   b) One side of a plane wall is maintained at 1000^0 C, while the other side is exposed to a convection environment having T=100^0 C and h= 11 W /m^2 K The wall has k=1.6 W/m K and is 40 cm thick. Calculate the heat transfer rate through the wall. (7M)

6. a) Derive an expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel. (7M)

   b) A pair of involute spur gears with 16° pressure angle and pitch of module 6 mm is in mesh. The number of teeth on pinion is 16 and its rotational speed is 240 r.p.m. When the gear ratio is 1.75, find in order that the interference is just avoided; i) the addenda on pinion and gear wheel ; ii) the length of path of contact ; and iii) the maximum velocity of sliding of teeth on either side of the pitch point. (7M)

7. a) Write a brief note on Thermodynamic principles and laws. (7M)

   b) Differentiate Internal combustion and spark ignition engines. (7M)