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

I B. Tech II Semester Supplementary Examinations, April/May - 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) Why a transformer has iron core? (2M)
   b) Give two applications of series motor and shunt motor each. (2M)
   c) What is the relation between speed and frequency in a synchronous generator? (2M)
   d) Mention the classification of moving iron instruments. (2M)
   e) Name the different forms of Renewable energy. (2M)
   f) Identify the mode of heat transfer in the following: (2M)
   (i) Heat loss from a thermo flask;
   (ii) Heating of water in a bucket with an immersion heater.
   g) Define addendum circle and gear ratio. (2M)

PART -B

2. a) Explain the principle of torque production in a DC motor and derive its equation. (7M)
   b) The efficiency of a 1000 kVA, 110/220 V, 50 Hz, single-phase transformer is 98.5% at half load and 0.8 power factor leading and 98.9% at full-load unity power factor. Determine (i) iron loss and (ii) full-load copper loss. (7M)

3. a) Explain how regulation of an alternator can be found using synchronous impedance method. (8M)
   b) A 4-pole, three-phase induction motor operates from a supply whose frequency is 60 Hz. Calculate (i) the speed of the rotor when the slip is 0.03 (ii) the frequency of rotor currents when the slip is 0.04 (iii) the speed of rotating magnetic field with respect to rotor. (6M)

4. a) Explain eddy current damping and fluid friction damping methods. (8M)
   b) A 230 V single-phase energy meter has a constant load current of 10 A at unity power factor. If the meter disc makes 1,150 revolutions during 2 hours, calculate the meter constant. If the power factor is 0.8, what would be the number of revolutions made by the disc in the same time? (6M)
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5. a) Compare 4-stroke and 2-stroke engines. (6M)

   b) Explain the working of four stroke diesel engine with a neat sketch. (8M)

6. a) Derive the expression for efficiency and effectiveness of rectangular fins. (8M)

   b) Distinguish between laminar and turbulent flow in a physical sense. (6M)

7. a) What do you mean by open belt drive? Find the length of the belt in open belt drive. (8M)

   b) With the help of a neat sketch explain gas welding process. (6M)

Code No: R161214 **R16** SET - 2

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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 is the significance of turns ratio in a transformer? (2M)

b) Why field coils of a DC shunt generator are wound with a large number of turns of fine wire? (2M)

c) What are the drawbacks of synchronous impedance method? (2M)

d) What is an energy meter? (2M)

e) State the Second law of thermodynamics. (2M)

f) Explain the difference between natural and forced convection. (2M)

g) Define the following: (a) Brazing ; (b) Soldering (2M)

PART -B

2. a) Describe various types of DC machines with suitable diagrams. (7M)

b) A 100 kVA, 3300/200 V, 50 Hz single phase transformer has 100 turns on the secondary. Calculate (i) the primary and secondary currents (ii) the approximate number of primary turns and (iii) the maximum value of flux. (7M)

3. a) Explain the working principle of a 3-phase alternator. (7M)

b) Derive the torque equation of an Induction motor and draw its torque-slip curve. (7M)

4. a) Explain the working of an Induction-type single-phase energy meter with a neat sketch. (9M)

b) The full-scale deflection current of an ammeter is 1 mA and its internal resistance is 100 Ω. If this meter is to have full-scale deflection at 5 A, what is the value of the shunt resistance to be used? (5M)

5. a) Explain the working of Four stroke petrol engine with neat sketches. (6M)

b) A four stroke petrol engine with a compression ratio of 6.5:1 and total piston displacement of 5.2×10^{-3} m^3 develops 100kW brake power and consumes 33kg of petrol per hour of calorific value 44300 kJ/kg at 3000 rpm. Find (i) Brake thermal efficiency; (ii) Indicated Thermal Efficiency. Assume a volumetric efficiency of 80 %. One kg of petrol vapour occupies 0.26 m^3 at1.013 bar and 15^0C. Take R for air 287 J/kg K. (8M)
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6. a) Describe the mechanism of heat convection. Define various heat transfer parameters. (6M)

   b) Sketch various types of fin configurations. (8M)

7. a) How do you specify a Lathe? (6M)

   b) How do you classify welding processes? Explain briefly. (8M)

Code No: R161214 **R16** SET - 3

I B. Tech II Semester Supplementary Examinations, April/May - 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) Why efficiency of a transformer is high as compared to other electrical machines? (2M)

b) Why is the series field winding wound with few turns of thick wire? (2M)

c) Write any two applications of three-phase induction motor. (2M)

d) What is the difference between an ammeter and a voltmeter? (2M)

e) Compare petrol engine and diesel engine. (2M)

f) What do you mean by black body radiation? (2M)

g) Define Forging. Name the different forging operations. (2M)

PART -B

2. a) Describe the working of a 3-point starter having no-load and overload protections for starting a DC shunt motor. (7M)

b) A 6300/210 V, 50 Hz, single-phase transformer has per turn e.m.f of about 8 volts and maximum flux density of 1.2 T. Find the number of low-voltage and high-voltage turns and the net cross-sectional area of the core. (7M)

3. a) Explain how a sinusoidal alternating emf is induced in an alternator. (7M)

b) The power input to rotor of a 400 V, 50 Hz, 6-pole, three-phase induction motor is 90 kW. The rotor emf is observed to make 180 cycles per minute. Calculate (i) slip, (ii) rotor speed, (iii) mechanical power developed (iv) speed of stator field with respect to rotor. (7M)

4. a) Explain the role of deflecting and controlling torque in an indicating instrument. (7M)

b) Describe the working of a moving coil instrument with a neat sketch. (7M)

5. a) Define and Compare renewable and non renewable resources. List the different forms of renewable energy. (7M)

b) Briefly discuss all the Laws of thermodynamics. (7M)

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6. a) A hot plate of length 0.75m, width 0.5m and thickness 2cm is placed in air stream at 20°C. It is estimated that a total of 300W is lost from the plate surface by radiation. Taking the convective heat transfer coefficient as 25 W/m^2K, and the thermal conductivity of the plate as 43 W/mK, calculate the inside temperature of the plate. (6M)

   b) State the Planck's law. Write down the expression for the radiation intensity. (8M)

7. a) How are gears classified? State the applications of gears. (6M)

   b) Explain the principle of rolling and extrusion with neat sketches. (8M)

Code No: R161214 **R16** SET - 4

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 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 is voltage regulation? Write the expression for voltage regulation. (2M)
   b) Why is the starting current high in a DC motor? (2M)
   c) What do you mean by slip in an induction motor? (2M)
   d) Why PMMC instruments cannot be used for AC measurements? (2M)
   e) Define the following (i) Brake Power (ii) Mechanical efficiency. (2M)
   f) Define Thermal radiation. (2M)
   g) Write a short note on chain drive. (2M)

PART -B

2. a) Explain armature voltage control method for speed control of DC motor. (7M)
   b) Derive the expression for voltage regulation of a transformer. (7M)

3. a) Discuss briefly the constructional details of an alternator. (6M)
   b) In a 4-pole, three-phase, 50 Hz induction motor with star-connected rotor, the rotor resistance per phase is 0.3 Ω, the reactance at standstill is 1.5 Ω per phase, and an emf between the slip-rings on open-circuit is 180 V. Calculate (i) slip at a speed of 1450 rpm (ii) rotor emf per phase and (iii) rotor frequency and reactance at a speed of 1450 rpm. (8M)

4. a) Describe the working of a moving iron instrument with a neat sketch. (7M)
   b) A moving coil instrument has a resistance of 5 Ω and gives a full-scale deflection of 100 mV. Show how the instrument may be used to measure: (i) voltage up to 50 V (II) currents up to 10 A. (7M)

5. a) A four cylinder, four stroke petrol engine has a bore of 57 mm and stroke of 90 mm. Its rated speed is 2800 rpm, torque is 55.2 Nm. The fuel consumption is 6.74 liters/hour. The density of the petrol is 735 kg/m^3 and petrol has a calorific value of 44200 kJ/kg. Calculate brake power, brake thermal efficiency and brake specific fuel consumption. (6M)
   b) Discuss the functions of any five engine components. (8M)

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6. a) Explain the different modes of heat transfer with neat sketches. State the basic laws of radiation. (7M)

   b) Define any three Radiative properties and describe the effect of heat transfer for extended surfaces. (7M)

7. a) Discuss the classification of Lathes. State the different operations that can be performed on lathe. (7M)

   b) Write the advantages, disadvantage and application of Belt and rope drives. (7M)