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

I B. Tech II Semester Regular Examinations, April/May - 2017 ELECTRICAL AND MECHANICAL TECHNOLOGY
(Com. to ECE, EIE, ECC)

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) Write the operating principle of a DC generator. (2M)
   b) What are the applications of induction motor? (2M)
   c) Define controlling and damping torque. (2M)
   d) What is the function of vertical deflecting plate in a CRO? (2M)
   e) What do you understand by TDC and BDC? (2M)
   f) Explain the distinction between Absorptivity and Reflectivity. (2M)
   g) What is a Worm and a Worm wheel? Where is it used? (2M)

PART –B

2. a) Derive the EMF equation of a DC generator. (7M)
   b) Explain construction and working of a single phase transformer. (7M)

3. a) Draw and explain slip-torque characteristics of an induction motor. (8M)
   b) An induction motor having 8- poles runs at 50 Hz supply. If it operates at full load at 720 rpm, calculate the slip. (6M)

4. Draw the block diagram of general purpose CRO. Explain the functions of various blocks. (14M)

5. a) Discuss in detail the differences between Four Stroke and Two Stroke engines. (6M)
   b) A certain engine with a bore of 250 mm has an indicated thermal efficiency of 30%. The brake specific fuel consumption and specific power output are 0.35 kg/kWh and 90 kW/m^2. Find the mechanical efficiency and brake thermal efficiency of the engine. Take the calorific value of the fuel as 42 MJ/kg. (8M)

6. a) Explain the effect of extended surfaces on heat transfer. Discuss in detail the classification of fins with neat sketches. (7M)
   b) A cubical tank of water of volume 1 m^3 is kept at a steady temperature of 65^0C by a 1 kW heater. The heater is switched off. How long does the tank take to cool to 50^0C, if the room temperature is 15^0C? (7M)

7. a) How is a Lathe specified? Explain with a neat sketch the relevance of each of the specification points. (8M)
   b) Explain how Brazing is different from welding. Why is Brazing more extensively used in industrial practice? (6M)

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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) Define regulation and efficiency of a transformer. (2M)
   b) Write principle of operation of an alternator. (2M)
   c) What is the difference between MC and MI instruments? (2M)
   d) Write the applications of DC series motor. (2M)
   e) What do you understand by (i) Brake Power; (ii) Specific Fuel Consumption (2M)
   f) Define Efficiency and Effectiveness of a Fin. (2M)
   g) What is the difference between Double-Helical and Herringbone gears? (2M)

PART -B

2. a) Derive the EMF equation of a single-phase transformer. (7M)
   b) An 8-pole, wave-connected armature has 600 conductors and is driven at 625 rev/min. If the flux per pole is 20 mWb, determine the generated e.m.f. (7M)

3. a) Explain how a rotating magnetic field is created in a three-phase induction motor when a balanced three-phase ac supply is applied at the stator terminals. (7M)
   b) A 3-phase, 60 Hz induction motor has 2 poles. If the slip is 2% at a certain load, determine (i) the synchronous speed, (ii) the speed of the rotor and (iii) the frequency of the induced e.m.f.'s in the rotor. (7M)

4. a) Explain the working principle of moving coil type ammeter with a neat diagram. (7M)
   b) Explain the terms deflection torque, controlling torque and damping torque. (7M)

5. a) Discuss in detail the differences between Spark Ignition and Compression Ignition engines. (6M)
   b) A four stroke Compression Ignition engine develops a brake power of 368 kW while 73.6 kW is used to overcome the friction losses. It consumes 180 kg/h of fuel at an air-fuel ratio of 20:1. The heating value of fuel is 42000 kJ/kg. Calculate (i) Indicated Power; (ii) Mechanical Efficiency; (iii) Indicated Thermal Efficiency; (iv) Brake Thermal Efficiency. (8M)

6. a) Discuss in detail the differences between Forced and Natural Convection. (6M)
   b) A thin metallic plate is insulated at the back surface and is exposed to the sun at the front surface. The front surface absorbs solar radiation at 900 W/m^2 and dissipates it mainly by convection to the ambient air at 30^0C. If the heat transfer coefficient between the plate and the air is 15 W/m^2K, what is the temperature of the plate? (8M)

7. a) Distinguish between Arc and Gas welding processes from the point of view of Heat concentration, Temperature, Ease of operation and Running cost. (8M)
   b) What is the requirement of fluxes in Brazing? Give details of some of the fluxes used in brazing with their applications. (6M)

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

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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) List out different losses that occur in a transformer. (2M)
b) Define slip. Give its significance in an induction motor. (2M)
c) What is the difference between wattmeter and energy meter? (2M)
d) What is the disadvantage with armature resistance speed control method? (2M)
e) What do you understand by (i) Frictional Power; (ii) Brake Thermal Efficiency (2M)
f) Explain the distinction between Laminar and Turbulent flows. (2M)
g) Name the different gears used for (i) Parallel shafts; (ii) Intersecting shafts. (2M)

PART -B

2. a) Explain the operation of 3-point starter with a neat diagram. (7M)
b) A 200 kVA rated transformer has a full-load copper loss of 1.5 kW and an iron loss of 1 kW. Determine the transformer efficiency at full load and half load for 0.85 power factor. (7M)

3. a) Explain the construction and working principle of a three phase induction motor. (8M)
b) The frequency of the supply to the stator of a 6-pole induction motor is 50 Hz and the rotor frequency is 2 Hz. Determine (i) the slip, and (ii) the rotor speed in rev/min. (6M)

4. a) Explain the working of a single phase wattmeter. (7M)
b) Explain the working principle of a moving iron type voltmeter. (7M)

5. a) Discuss in detail the differences between Renewable and non Renewable energy resources. (7M)
b) What are the important basic components of an Internal Combustion engine? Explain them briefly. (7M)

6. a) Discuss in detail, Fourier's law of Heat conduction. What are the assumptions made? (6M)
b) An immersion water heater of surface area 0.1 m^2 and rating 1 kW is designed to operate fully submerged in water. Estimate the surface temperature of the heater when the water is at 40^0C and the heat transfer coefficient is 300 W/m^2K. If this heater is by mistake used in air at 40^0C with heat transfer coefficient of 9 W/m^2K, what will be the surface temperature? (8M)

7. a) Explain the resistance welding process giving the equipment, parameters controlled and the applications. (7M)
b) Distinguish between Brazing and soldering from the point of view of the filler metalsused,applicationsandthestrengthofthejointobtained (7M)

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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 function of starter in a DC machine? (2M)
   b) What is the operating principle of an induction machine? (2M)
   c) What is the function of horizontal deflecting plate in a CRO? (2M)
   d) What are different types of DC machines? (2M)
   e) What do you understand by (i) Indicated Thermal Efficiency; (ii) Mechanical Efficiency? (2M)
   f) Explain Radiation Intensity of a Black body. (2M)
   g) What do you mean by Initial Tension in a Belt Drive? (2M)

PART -B

2. a) Explain various methods of speed control of DC Motor. (7M)
   b) A 4500 V/225 V, 50 Hz single-phase transformer is to have an approximate e.m.f. per turn of 15 V and operate with a maximum flux of 1.4 T. Calculate (i) the number of primary and secondary turns and (ii) the cross-sectional area of the core. (7M)

3. a) Explain the synchronous impedance method to determine the regulation of an alternator. (8M)
   b) Discuss the applications of induction motor. (6M)

4. a) Explain the working of single phase energy meter. (7M)
   b) Compare and contrast between MI and MC instruments. (7M)

5. a) Classify the Internal Combustion engine with respect to: (i) Cycle of operation; (ii) Type of Ignition; (iii) Types of fuels used; (iv) Type of cooling. (6M)
   b) A petrol engine uses a fuel of calorific value of 42000 kJ/kg and has a specific gravity of 0.75. The brake thermal efficiency is 24% and mechanical efficiency is 80%. If the engine develops a brake power of 29.44 kW, calculate (i) Volume of fuel consumed per second; (ii) Indicated thermal efficiency. (8M)

6. a) Explain the different modes of Heat Transfer in detail. (7M)
   b) A circular plate of 0.2 m diameter has one of its surfaces insulated, and the other is maintained at 550K. If the hot surface has an emissivity of 0.9 and is exposed to the air at 300K, calculate the heat loss by radiation from the plate to the air. (7M)

7. a) What are the specific advantages and disadvantages of the resistance welding process? (5M)
   b) Explain briefly the procedure of the manual metal arc welding process. (5M)
   c) Explain how Extrusion is compared with Rolling. (4M)

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