

4TH SEM./ELECTRICAL/ 2023(S)

TH-1 ENERGY CONVERSION-I

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. State the function of yoke and commutator in a dc machine.
 - b. Define commutation.
 - c. What is back emf in dc motor?
 - d. What are the losses in dc motor?
 - e. Define transformation ratio of transformer.
 - f. What are the losses in a transformer? Also define regulation of transformer.
 - g. State two uses of auto transformer.
 - h. Define ratio error.
 - i. State two uses of C.T.
 - j. Define all day efficiency.
2. Answer **Any Six** Questions 6 x 5
 - a. Classify dc generators and explain with neat diagram.
 - b. A 4 pole lap wound d.c shunt generator has a useful flux per pole of 0.09 Wb. The armature winding consists of 220 turns, each of 0.005Ω resistance. Calculate the terminal voltage when running at 1000 rpm if the armature current is 50 A.
 - c. Explain briefly about the speed control of dc shunt motor by armature voltage control method.
 - d. Sketch the load characteristics of various types of dc motors.
 - e. Define efficiency of a transformer. State and derive the expression for condition for maximum efficiency.
 - f. What are the conditions for parallel operation of two single phase transformers.
 - g. Explain the working principle of single phase auto transformer with neat diagram.

- 3 A 250 volt shunt motor has an armature resistance of 0.5Ω and the field resistance of 250Ω . When driving a load, the torque of which is constant takes 30 amp and runs at 500 rpm. It is desired to raise the speed of the motor to 750 rpm. What resistance should be inserted in the shunt field circuit, assuming the magnetization curve to be straight line. 10
- 4 Define armature reaction .Explain it briefly. Write down its effects. 10
- 5 Compare auto-transformers with two-winding transformers both having equal kVA rating. Find the ratio of copper required if the ratio of number of turns of the transformer is three. 10
- 6 A 4 kVA ,200/400 volt,1-phase transformer takes 0.7 amp and 65 watt on open circuit. When the low voltage winding is short circuited and 15 volt is applied to the high-voltage terminals, the current and power are 10 amp and 75 watt respectively. Calculate the full load efficiency at unity power factor and full-load regulation at 0.80 power factor lagging. 10
- 7 What is the necessity of starter in dc motor. Explain briefly about the operation of 4-point starter with neat diagram. 10

4TH SEM. /EE/EEE/EE(I & C)/ 2023(S)

TH-2 Analog Electronics and Op-Amp

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. List any four applications of pn junction diode.
 - b. Draw the symbols of Tunnel diode, PIN diode, Zener Diode and pn-junction diode.
 - c. Define Peak Inverse Voltage and mention the value of PIV of half wave rectifier and full wave rectifier.
 - d. List different modes of operation of a transistor. In which mode, it can work as an amplifier?
 - e. Mention different types of MOSFET.
 - f. Name any two types of (a) oscillators (b) power amplifiers
 - g. Write any two advantages of FET over BJT.
 - h. Draw the DC load line of base resistor biased transistor.
 - i. Find the gain of an inverting op-amp having input resistance $R_{in}=100\Omega$ and feedback resistor $R_f=1000\Omega$.
 - j. Draw the pin diagram of IC 741 and name each pin.
2. Answer **Any Six** Questions 6 x 5
 - a. Differentiate between avalanche and Zener break down. (any 5)
 - b. Define α , β and γ of a BJT and establish the mathematical relationship between them.
 - c. Describe the working of a Tunnel diode and draw its V-I characteristics.
 - d. Explain different types for transistor configurations and plot their input and output characteristics.
 - e. Differentiate between voltage and power amplifier. (any 5)
 - f. Draw and explain the positive and negative clamper circuit with appropriate input and output waveforms.
 - g. Explain operational amplifier stages.
3. Explain the working principle Full Wave Bridge rectifier with a neat circuit diagram and derive its rectification efficiency. 10
4. With neat diagram describe the working principle of RC coupled amplifier with its frequency response curve. 10
5. Describe the need of transistor biasing and explain different methods of transistor biasing. 10
6. With neat sketch, explain the working of Class – A push pull amplifier. 10
7. Explain the operation of integrator and differentiator using OP-AMP with neat diagrams. 10

4TH SEM. / ELECT & ETC/ ELECTRICAL/ 2023(S)
TH-3 ELECTRICAL MEASUREMENT & INSTRUMENTATION

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define accuracy and tolerance.
 - b. Write two differences between a moving coil and moving iron instrument.
 - c. Write down any two types of errors in a dynamometer type watt meters.
 - d. State two applications of megger.
 - e. Why holes are drilled on the opposite sides of the disc of an energy meter?
 - f. Define transducer.
 - g. State two applications of LVDT.
 - h. What is hall effect?
 - i. What are the main parts of cathode ray tube?
 - j. Define tachometer and state the types.
2. 6 x 5
 - a. Give a brief classification of measuring instruments. Also state the essential features of indicating instruments.
 - b. Write down the working principle of PMMC instruments and its advantages.
 - c. Write down the errors in dynamometer watt meters.
 - d. Give a brief classification of transducers.
 - e. State the applications of thermistors.
 - f. What is piezoelectric transducer? List the advantages of piezoelectric transducer.
 - g. State the applications of potentiometers.
3. Describe about the working of 1-phase induction type energy meter with suitable diagram. 10
4. Explain the principle of operation and working of Dynamometer type single phase power factor meters. 10
5. Explain how the measurement of inductance is done by Maxewell's Bridge method? 10
6. Explain with a neat diagram about the linear variable differential transformer. 10
7. Draw the block diagram oscilloscope and explain its principle of operation. 10

TH-4 Generation Transmission & Distribution

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Classify overhead transmission lines on its voltage and distance.
 - b. What factors are taken into account while selecting the site for a thermal power plant?
 - c. What is feeder & distributor?
 - d. A generating station has connected a load of 43MW and a maximum demand of 20MW; The units generated being 61.5×10^6 per annum. Calculate (i) demand factor (ii) load factor.
 - e. Define flat rate tariff.
 - f. What is grading of cables?
 - g. Name the important components of an overhead transmission line.
 - h. State Kelvin's law.
 - i. What do you mean by sheathing of cable?
 - j. Why are insulators used with overhead lines?

2. Answer Any Six Questions 6 x 5
 - a. What is corona? What are the factors which affect corona in overhead transmission line?
 - b. Draw a LT substation layout and name its important components.
 - c. Describe the Murray loop test method for location of short circuit fault in UG cable.
 - d. Derive an expression for voltage regulation of short transmission line.
 - e. What is electric power supply system? Draw a single line diagram of a typical a.c power supply scheme.

- f. What are the reasons of adopting EHV AC transmission? Write its limitations.
- g. A consumer has a maximum demand of 200KW at 40% load factor. If the tariff is Rs.100/KW of maximum demand plus 10 paisa per kWh, find the overall cost per kWh.
- 3 Describe the function of following elements in Nuclear Power Plant.(a) Moderator (b) Control Rod (c) Nuclear Reactor (d) Heat Exchanger (e) Turbine 10
- 4 Write briefly about different types of laying of underground cable. 10
- 5 An overhead transmission line at a river crossing is supported from two tower at heights of 50 m and 100m above the water level. The horizontal distance between the towers is 400m. If the tension in the conductor is 1800kg, find the clearance between the conductor and water at a point mid-way between the supports. Weight of conductor is 1 kg/m. 10
- 6 A 3-phase,50Hz overhead transmission line 100km long has the following constants: 10
Resistance/km/phase=0.1 ohm
Inductive reactance/km/phase=0.2 ohm
Capacitive susceptance/km/phase= 0.04×10^{-4} siemen.
Determine (i) the sending end current (ii) sending end voltage (iii) sending end power factor and (iv) transmission efficiency when supplying a balanced load of 10,000 kW at 66kV, p.f. 0.8 lagging. Use nominal T method.
- 7 What are the causes of Low power factor and explain the methods for improving the power factor in power system. 10