4^{TH} SEM./ ELECTRICAL/ 2022(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. What is the number of parallel paths in lap winding and wave winding in DC machines?
b. What is the role of back emf in DC motor running?
c. Why breather is used in transformer?
d. What are the factors which affect the torque of DC motor?
e. State the two methods of improving commutation in DC Generator.
f. What do you mean by burden in instrument transformers?
g. State any two cooling methods of transformer.
h. What is 'all day efficiency' in distribution transformers?
i. Why the C.T. secondary should not be kept open?
j. Write any two applications of Auto transformer.

2. Answer Any **Six** Questions 6 x 5

a. Describe the armature control method in speed control of DC shunt Motors.
b. Write the differences between core type transformer and shell type transformer.
c. Explain the role of compensating windings in DC generator.
d. A 4-pole, lap wound DC shunt generator has a useful flux per pole of 0.07 Wb. The armature winding consists of 220 turns each of 0.004Ω resistance. Calculate the terminal voltage when running at 900 RPM if the armature current is 50 A.
e. Explain the operation of ON Load Tap changer in transformer using resistor transition.
f. Write a short note on potential transformer (PT).
g A 25 kVA transformer has 500 turns on the primary and 50 turns on the secondary winding. The primary is connected to 3000V, 50Hz supply. Find the full load primary and secondary currents, the secondary e.m.f and the maximum flux in the core. Neglect leakage drops and no load primary current.

3	Explain the saving of copper in auto transformer as compared to ordinary two winding transformer.	10
4	The armature winding of a 4-pole, 250V DC shunt motor is lap connected. There are 120 slots in each slot containing 8 conductors. The flux per pole is 20 mWb and current taken by the motor is 25A.The resistances of armature and field circuit are 0.1Ω and 125Ω respectively if the rotational losses amount to be 810W. Find (i) Gross torque (ii) Useful torque and (iii) Efficiency.	10
5	Describe the process of commutation in DC Generator along with sketch diagram in details.	10
6	Explain about the care and the maintenance of transformer on daily, monthly and yearly basis.	10
7	A 25 kW, 250V, DC shunt generator has armature and field resistances of 0.06 ohm and 100 ohm respectively. Determine the total armature power developed when working (i) as a generator delivering 25 kW output and (ii) as a motor taking 25 kW.	10

4th Sem. / EEE/ELECTRICAL/ELECTRICAL(INST & CTRL)/ 2022(S)

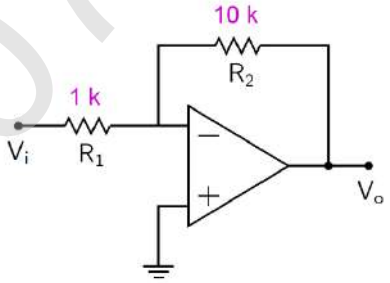
Th2 ANALOG ELECTRONICS AND OPAMP

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 knee voltage of a PN junction diode. Write the values of cut in voltage for Si and Ge diode.
b. What is the role of intrinsic (I) layer in a PIN diode?
c. Define ripple factor and mention its values for Half Wave and Full Wave rectifier.
d. Draw the transistor configurations for CB, CE.
e. What are the needs for transistor biasing?
f. Write the advantages of negative feedback in amplifier.
g. Differentiate between BJT and FET.
h. Define CMRR and Slew Rate of an OPAMP.
i. If $V_i = -10V$, then find V_0 .



j. Draw the simplified circuit diagram of a series clipper. Plot its output waveform for an input $v_i(t) = 5 \sin \omega t$

2. Answer **Any Six** Questions 6 x 5

a. Explain the working of Zener diode as voltage regulator.
b. Define a filter circuit? Draw the circuit diagram of pi (π) filter and explain its working.
c. Draw the circuit diagram for voltage divider bias configuration. Determine its operating point and stability factor.
d. Differentiate between voltage and power amplifier.
e. Design a subtractor using OPAMP.

f. Find the h parameters of CE configuration and draw the simplified diagram.

g Find the expressions for voltage gain of inverting and non-inverting OPAMP.

3	With neat circuit diagram explain the working of RC coupled amplifier with its frequency response curve.	10
4	With neat circuit diagram explain the working of Class – B push pull amplifier.	10
5	Define Barkhausen Criterion for oscillation. Draw the circuit diagrams of Colpitts and Hartley oscillator using BJT. Also specify their frequency of oscillation.	10
6	Design an integrator and a differentiator using OPAMP.	10
7	Explain the working of full wave bridge rectifier. Derive the expressions for DC and RMS values of rectifier output. Calculate its rectification efficiency and ripple factor.	10

4TH SEM /ELECT/ EEE/ 2022(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 sensitivity.
b. State the types of measuring instruments.
c. What are the three essential features of indicating instruments?
d. State the classification of moving coil instruments.
e. State the types of errors in dynamometer wattmeters.
f. Define creeping and what is its cause?
g. Write down two advantages of bridge circuits.
h. Define transducer.
i. State two uses of capacitive transducers.
j. What is a CRO?

2. Answer **Any Six** Questions 6 x 5

a. Write down the advantages of moving iron instruments.
b. Give a comparison between analog and digital multi meter.
c. What is a megger? Explain its construction with working principle.
d. Define Hall effect. Write some applications of Hall effect transducers.
e. State the operating principle of induction type wattmeter. Write down the advantages and disadvantages of it.
f. State the applications of CRO.
g What is a thermistor? Write down the applications.

3 Explain Deflecting, controlling and damping arrangements in indicating type of instruments. 10

4 Describe Construction and principle of working of Dynamometer type wattmeter. 10

5 Explain the principle of operation and working of dynamometer type single phase power factor meter. 10

6 Explain the construction and working principle of LVDT with a neat diagram. 10

7 With a neat diagram, explain briefly the main parts of a cathode ray tube. 10

4^{TH} SEM./ EEE /ELECTRICAL /ELECTRICAL(I & C) /EME / 2022(S)

Th4 Generation, Transmission and 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. What is photovoltaic effect?
b. Why transmission of electric power by high voltage DC is superior to that of high voltage AC system?
c. State Kelvin's law.
d. What are the factors affecting sag in an overhead line?
e. Write the methods of reducing corona effect?
f. What is a booster transformer?
g. Write the characteristics of Tariff.
h. Define diversity factor.
i. What do you mean by Ferranti effect?
j. Define voltage regulation.

2. Answer **ANY SIX** questions 6 x 5

a. Describe the working of Nuclear power plant with proper sketch.
b. Differentiate between EHVAC and HVDC system.
c. Explain different connection schemes of distribution system.
d. A two wire distribution AD is 225m long. The various loads and their positions are given below

At point	Distance from A in meters	Concentrated load in A
B	75	12
C	175	15
D	225	20

The cross sectional area of each conductor is 0.27 cm^2. The end A is supplied with 250 V. Resistivity of the wire is 1.78μΩ cm. Calculate the current in each section of the conductor, the two core resistance of each section and the voltage at each tapping point.

e. Describe Murray loop test for localization of earth fault in underground cables.
f. Explain different types of insulator.

	g	A generating station has following data Installed capacity= 300 MW, capacity factor= 50%, Annual load factor=60%, Annual cost of fuel, oil, etc= Rs. 9×10^7, capital cost= Rs. 10^9, annual interest & depreciation= 10%. Calculate minimum reserve capacity of the station and the cost per kWh generated?	
3		a. Define Sag. b. A transmission line has a span of 250m between supports, the supports being at same level. The conductor has a cross-sectional area of 1.29 cm^2. The ultimate strength is 4220 kg/cm^2 and factor of safety is 2. The wind pressure is 40 kg/cm^2. Calculate the height of the conductor above ground level at which it should be supported if a minimum clearance of 7m is to be kept between the ground and the conductor.	02 08
4		A 3 phase, 50 Hz overhead transmission line has following constants Resistance/phase=9.6 ohm, Inductance/phase= 0.097mH, Capacitance/phase=0.765µF If the line is supplying a balanced load of 24000 KVA 0.8 p.f lagging at 66 KV, using nominal π method Calculate i. Sending end current ii. Line value of sending end voltage iii. Sending end power factor iv. Percentage regulation v. Transmission efficiency.	10
5		A three phase ring main ABCD fed at A at 11 KV supplies balanced loads of 50A at 0.8 p.f lagging at B, 120A at unity p.f at C and 70A at 0.866p.f lagging at D, the load currents being referred to the supply voltage at A. The impedances of the various sections are: Section AB=(1+j0.6)Ω ; Section BC=(1.2+j0.9)Ω ; Section CD=(0.8+j0.5)Ω ; Section DA=(3+j2)Ω. Calculate the currents in various sections and station bus-bar voltages at B, C & D.	10
6		a. State different type of Bus-bar arrangements in substation. b. Draw the layout of 66/11 KV substation.	03 07
7		Write short notes on a. Necessity of EHVAC Transmission. b. Laying of Underground cables.	5×2

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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 0.5 Ω and the field resistance of 250 Ω. 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

4^{TH} 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}=100Ω and feedback resistor R_f =1000 Ω.
   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 $\alpha, \beta and\ \gamma$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 explainthe 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 frequencyresponse 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

4^{TH} SEM./ ELECT./ELECT. & MECH./ ELECT. & ETC./EE(I & C)/ 2023(S)

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 lying 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: Resistance/km/phase=0.1 ohm Inductive reactance/km/phase=0.2 ohm Capacitive susceptance/km/phase=0.04×10-4siemen. 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.	10
7	What are the causes of Low power factor and explain the methods for improving the power factor in power system.	10