Q.P.Code: 38369

Time: 3 Hours **Total Marks – 80**

N.B: (1) Q. No. 1 is compulsory
(2) Attempt **any three** out of remaining questions
(3) Figures to right indicate full marks & assume data wherever necessary

Q1 Attempt **any four** out of the following **(20)**

(a) State and explain Gauss law of electrostatics.

(b) Explain point form of continuity equation.

(c) State and explain Lorentz force equation.

(d) Find force on Q_2=200μc at P_1 (0, 4, 0) due to Q_1 = -150μc at P_2 (-3, 0, 0) in free space.

(e) Define characteristics impedance and propagation constant.

Q2 (a) Prove that the tangential component of E is continuous across a dielectrics Interface and D is discontinuous **(10)**

(b) $\mathbf{D}= (10r^3 /4)\ \mathbf{a_r}\ (c/m^2)$ in cylindrical co-ordinates. Evaluate both sides of divergence theorem for the volume enclosed by r=1 and r=2m, z=0 and z=10m. Calculate the outward flux. **(10)**

Q3 (a) Explain magnetic scalar and vector potentials and derive the expression for them **(10)**

(b) Current density $\mathbf{J}=10^2 \sin\theta\ \mathbf{a_r}\ A/m^2$ in spherical co-ordinate. **(10)**
Find current crossing the spherical shell of radius r=0.02m

Q4 (a) Define inductance and mutual inductance. Derive inductance of solenoid **(10)**

(b) Find the potential variation, e-field and capacitance between two spherical shells of radius a and b. When inner shell placed at a potential V_o and outer shell is grounded. **(10)**

Q6 (a) Define uniform plane wave and derive the expression for lossy dielectrics. **(10)**

(b) Given $\mathbf{E}$= Em sin (wt-βz) $\mathbf{a_y}$, in free space. Find **D, H, B** at t=0 **(10)**

Q7 (a) A 300 MHz plane wave propagates through fresh water (σ=0) μr=1, ε_r =78. **(10)**
Calculate η, v, λ, β, alpha and delta.

(b) State Maxwell's equation in AC and DC form. **(10)**

****

Q.P. Code: 24377

Time: 3 Hours **Total marks : 80**

Note: 1) Question No.1 is compulsory.
2) Attempt any three questions out of remaining five question.
3) Assume suitable data if required.

1. Solve any four each carry equal marks. 20

a) Define and explain inrush current in 3 phase transformer.

b) Explain the operating principle of three phase induction motor.

c) Name the different methods of starting of 1-phase Induction motor and explain any one.

d) Explain need of parallel operations of transformers and write necessary condition for parallel operation.

e) Draw and explain torque slip characteristics of 3 phase I.M.

2)a. Describe in brief connection and phasor diagram of various phasor groups in 3-phase transformer. 10

b. Two three phase transformers rated at 500 KVA and 450 KVA respectively and connected in parallel to supply a load of 1000 KVA at 0.8 PF lagging.The per phase leakage resistance and reactance of the first transformer is 2.5% and 6% respectively and of second transformer 1.6% and 7% respectively.Calculate the KVA load and PF at which each transformer operates. 10

3.a Explain different speed control methods of 3-phase induction motor. 10

b. An 18.65 KW,4 pole, 50 Hz, 3-phase induction motor has friction and windage losses of 2.5% of the output. The full load slip is 4%.Find for full load (i)Rotor copper loss (ii) Rotor input (iii)Shaft torque. 10

4. a. Explain the need of starter for 3 phase I.M. and explain auto-transformer starter in detail. 10

b. A 14.9KW , 400V , 4pole , 50Hz 3 phase star connected I.M. give the following test result

	Line current(A)	Power i/p (w)	Line voltage(v)
N.L. test	9	1250	400
Blocked rotor test	38	4000	150

Assume stator and rotor ohmic losses are equal at standstill. Draw circle diagram and find line current , power factor , slip , and efficiency at F.L. 10

5. a . Draw equivalent circuit diagram of single phase I.M. based on double field revolving theory and explain the double field revolving theory. 10

b. Explain shaded pole 1 phase I.M. in detail. 10

6. Write short note on any two 20

a. Scott connection of two 3 phase transformers.

b. Induction generator.

c. Mechanical forces in 3-phase transformer.

F1860E307F31E26F1028D775F138EE2A

(Time: 3 Hours) **[Total marks: 80]**

N.B:- (1) **Question 1 is compulsory**
(2) Solve any **three** questions from remaining **five** questions.
(3) Figures to the right indicate **full** marks.

Q 1. Answer the following questions. **20**
a) Explain the importance of different types of instrument transformers
b) What is the role of isolator in power system? Explain.
c) What are the difficulties associated with differential protection
d) Explain primary, back up and remote backup protection of relay.

Q 2 a) What is working principle of distance relays. Differentiate between different types of distance relays. **10**

Q 2 b) Explain with neat diagram construction and working principle of MOCB. **10**

Q 3 a) Explain construction & working of Air circuit breaker. **10**

Q 3 b) Name the different types of fault that occur in transformer. Explain bucholz relay for protection of transformer. **10**

Q 4 a) Explain with neat construction any one type of Induction relay. **10**

Q 4 b) Explain desirable qualities of protection scheme required for efficient operation **10**

Q 5 a) What are the different types of fault that occur in Induction motor. Explain motor protection against single phasing. **10**

Q 5 b) Explain advantages of static relay over electromagnetic relays. **10**

Q 6 a) Discuss various properties of SF6 gas that make it suitable for arc quenching and explain SF6 CB in detail with suitable diagram. **10**

Q 6 b) Explain REF protection for alternator. How 100% winding is protected in an alternator. **10**

Q. P. Code: 23924

(3 Hours) [Total Marks: 80]

N.B: (1) Question **No.1** is **compulsory**.
(2) Answer any **three** from remaining **five** questions.
(3) Figures to the **right** indicate **full** marks.
(4) Assume the **data** if it is **necessary**.

1. Attempt **any four** of the following. **[20]**
   (a) Draw and Explain the Block diagram of Basic communication system.
   (b) Explain Shannon's Theorem on channel capacity.
   (c) Draw ASK, FSK, PSK waveforms for data bit sequence 11011001.
   (d) Explain need for modulation in communication system.
   (e) Explain the role of AGC in AM reception.

2. (a) Consider a (7,3) code whose Parity check matrix is given below. **[10]**

$$H = \begin{pmatrix} 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 & 1 \end{pmatrix}$$

(i) Construct syndrome table for signal bit error patterns.

(ii) Decode the received code vector R_1=0011101, R2= 1101110.

(b) Explain a method of generating DSB-SC AM signal with the help of waveforms. **[10]**

3.(a) Explain PCM transmitter and receiver with the help of neat block diagram. **[10]**

(b) In a fax transmission of a picture there are $2.25*10^6$ picture elements in a frame.12 brightness levels are required for faithful reception. Assuming all these levels are equiprobable, calculate channel bandwidth required to transmit 1 picture in every 3 minutes for a signal to noise ratio of 30dB. If signal to ratio is increased to 40 dB. Calculate new bandwidth. Comment on SNR-BW Trade off for the results obtained in above cases. **[10]**

4. (a) Derive FM wave equation, plot frequency spectrum of FM wave also explain carson's rule for FM Bandwidth . **[10]**

(b) Explain regarding BPSK (i) Transmission (ii) Reception (iii) waveform for data bit sequence b(t) = 1011001. Also plot frequency spectrum . **[10]**

5. (a) The Generator Polynomial of a (7,4) cyclic code is $g(x) = 1+x^2+x^3$. Draw feedback shift encoder. Use this encoder to find code word for the message (0011) in systematic form. **[08]**
   (b) What is Direct and Indirect method of FM generation? Also Explain Armstrong method of FM generation. **[12]**

6. Write short notes on **(any two)** **[20]**
   (a) Quantization in pcm system.
   (b) Power Line Carrier Communication.
   (c) Convolution codes.
   (d) Superhetrodyne reciever

****

Q.P. CODE: 36008

(3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Answer any **three** from the remaining **five** questions.
(3) **Assume** suitable **data** if necessary and justify the same.
(4) **Figures** to the **right** indicate the marks.

1. (a) Explain the operation of DIAC along with structured diagram and characteristics. **[5]**
   (b) Explain the multiple PWM technique to control the output voltage of an inverter. **[5]**
   (c) Explain the operation of Buck converter and derive the expression for duty cycle. **[5]**
   (d) Derive the expression of average voltage for single phase half wave controlled rectifier with RL load with circuit diagram and waveform. **[5]**

2. (a) State the limitations of R-firing circuit and explain the working of RC half wave triggering circuit. **[10]**
   (b) Compare the performance of MOSFET and IGBT. **[5]**
   (c) Discuss the need for snubber circuit in SCR. **[5]**

3. (a) Discuss the operation of single phase full wave rectifier (bridge configuration) for RL load. Derive the expression of average output voltage and draw the necessary waveform for output voltage and current, thyristor voltage, gate pulse and input voltage. **[10]**
   (b) Explain the working of three phase full converter with R load. Draw the corresponding input voltage and output voltage waveform for $\alpha = 60°$ **[10]**

4. (a) Explain the effect of freewheeling diode in single phase half wave rectifier with RL load. **[5]**
   (b) Explain the dynamic turn ON characteristics of SCR. **[5]**
   (c) Explain the sinusoidal PWM technique used in inverter. State the advantage of PWM technique. **[10]**

5. (a) Discuss the operation of three phase bridge inverter with 120° conduction mode. Draw the waveform for phase voltage and justify it. **[10]**
   (b) A boost converter has an input voltage of 10V. The average output voltage is 18V and average load current is 1A. The switching frequency is 20kHz. If L = 150µH and C = 220µF. Calculate (i) Duty cycle, (ii) inductor current ripple, (iii) the minimum and maximum value of inductor current, (iv) output voltage ripple and (v) the value of filter inductance and capacitance at boundary conditions. **[10]**

6. (a) Explain the operation of step down cycloconverter with neat circuit diagram. **[5]**
   (b) Give comparison between VSI and CSI. **[5]**
   (c) Explain the operation of single phase bidirectional phase control AC voltage controller connected to RL load. **[10]**

———————————————