T2925 / T0483 PROTECTION AND SWITCHGEAR ENGINEERING

Q.P. Code : 584202

(3 Hours) [Total Marks : 80

N.B.: 1) Question No.1 is compulsory.
  2) Attempt any three questions remaining five questions.
  3) Draw neat diagrams wherever it is necessary.

1. Answer the following : 20
   a) Explain loss of excitation in case of generator.
   b) Explain primary, back up and remote backup protection of relay.
   c) What is time grading and current grading used in protection system?
   d) Where and why isolators, contractors and circuit breakers are used in power system?

2. a) What are the different types of fault that occur in Induction motor? Explain motor 10
      protection against single phasing.
   b) Explain withneat diagram construction and working principle of MOCB. 10

3. a) With a neat diagram, explain working principle of induction disc relay with its 10
      application.
   b) Name the different types of fault that occur in transformer. Explain differential 10
      protection for star delta transformer.

4. a) Explain construction & working of Air curcuit breaker. 10
   b) Explain REF protection for alternator. How 100% winding is protected in an 10
      alternator.

5. a) What are the protections provided for rotor of an alternator. 10
   b) What are the different types of distance relay and explain characteristics of V-1
      and R-X plane of impdedance relay. 10

6. Write Short note on the following : 20
   a) Comparators
   b) High resistance and low resistance method
   c) Instrument Transformer
   d) HRC Fuse

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(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.   Attempt any four.   20

(a) Explain oscillating neutral phenomenon in three phase star connected transformer.

(b) Draw circuit diagram, torque slip characteristic and state applications of capacitor start capacitor run phase single phase induction motor.

(c) Draw torque-slip characteristic of three phase induction motor for v/f control method and explain the sections in brief.

(d) "The starting current of three phase induction motor is 5 to 7 times than its full load current" justify the statement.

(e) Why to perform no load and blocked rotor test on three phase induction motor?

(f) Draw phasor diagram and connection diagram for Dy1 and Yd 11 transformer. State the significance of number 11 and 1 in the same.

2.   (a) A three phase , star connected , 400V, 50Hz, 4 pole induction motor has the   10
following per phase constants in ohm referred to stator.
R_1=0.15, X_1=0.45, R_2=0.12, X_2=0.45, X_m=28.5
Fixed losses (core and friction and windagelosses)= 400 w. compute stator current, rotor speed , output torque and efficiency when motor is operated at rated voltage and frequency at a slip of 4%

(b) What is Switching inrush current phenomena in 3-phase transformer?   10

3.   (a) Explain torque-speed characteristic of three phase Induction motor.   08

(b) A 15 KW, 400V, 4 pole, 50 Hz, 3-phase star connected IM gave following test   12
result:

	Line current (A)	Power i/p (w)	Line voltage (v)
N.L. test	9	1310	400
Blocked rotor test	50	7100	200

Stator and rotor ohmic losses at standstill are assumed equal. Draw Circle diagram for Induction motor and Calculate: Line current power factor, slip, torque, efficiency at full load, Max. Power output and max. Torque.

TURN OVER

4. (a) Illustrate double field revolving theory for single phase induction motor. **10**

    (b) A 220 volts, 50 Hz, 4 pole single phase induction motor has the following **10**
    equivalent circuit parameters $R_{1m} = 2.2\Omega$, $R_2 = 4.5\Omega$ $X_2 = 2.6\Omega$, $X_{1m} = 3.1\Omega$,
    $X_m = 80\Omega$.

    Friction windage and core loss= 40 watts. For slip of 0.04, calculate: 1) input
    current 2) power factor, 3) developed power, 4) output power, and 5) efficiency.

5. (a) Illustrate the conditions required for successful parallel operation of 3-phase **10**
    transformers.

    (b) Two three phase transformers rated at 600 KVA and 450 KVA respectively **10**
    are connected in parallel to supply a load of 1100 KVA at 0.8 p.f. 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 power factor at which each transformer operates.

6. Write short note on any two:

    (a) Open delta connection of three phase transformer.

    (b) Double cage squirrel cage induction motor.   **20**

    (c) Harmonics in three phase transformers.

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3 Hours   Total Marks: 80

Instructions:
1. Question No. 1 is compulsory.
2. Answer any **three** from the remaining **five** questions
3. Figures to the right indicate full marks.

1   Solve **any four**:-   (5 x 4)
   a) Justify the statement, 'Divergence of curl of a quantity is zero.'
   b) What is high dielectric constant material? Describe its advantages.
   c) State and explain Biot Savart's law and Ampere circuital law.
   d) Derive point form of continuity equation.
   e) Enlist five properties of electromagnetic waves.

2 a) Derive an electric field intensity due to an infinite line having density ρ_l (C/m).   (10)
   b) Evaluate both sides of the divergence theorem for the electric flux density   (10)
      $\overline{D} = 3xy\overline{a_x} + x^2\overline{a_y}$ C/m² and the rectangular parallelepiped formed by the planes x=0 and
      2, y=0 and 3,z=0 and 4.

3 a) Derive boundary condition at the interface of two dielectric materials.   (10)
   b) Three equal point charges of 2μC are in free space at (0,0,0), (2,0,0) and (0,2,0)   (10)
      respectively. Find net force on the fourth charge of 5μC at (2,2,0).

4 a) Determine $\overline{H}$ on the axis of a circular current loop of radius 'a'. Specialize the result at   (10)
      the center of the loop.
   b) The electric field intensity $\overline{E}$ in time varying field is given by $\overline{E} = E_m \sin(\omega t - \beta z)\overline{a_y}$ in
      free space. Determine $\overline{D}, \overline{B}$ and $\overline{H}$.   (10)

5 a) Derive Maxwell's equations and tabulate them in the time domain and frequency   (10)
      domain.
   b) Formulate inductance of a solenoid and a toroid with circular cross section.   (10)

6 a) Derive wave equation and explain wave in a dielectric and conducting medium.   (10)
   b) Find the propagation constant at 400MHz for a medium in which ε_r=16,μ_r=4.5 and   (10)
      σ =0.6 S/m. Find the ratio of the velocity v to free-space velocity c.

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TE-sem-Ⅴ-CBSGS-Electrical   5/6/17

QP CODE : 584301

(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.   (5*4)

(a) What is Entropy of an information source. When is Entropy maximum.

(b) Define Code rate, Hamming weight, Hamming distance. Also explain the role of 'd_{min}' in determining the Error in a code word. .

(c)Differentiate between Analog communication and Digital communication.

(d)Explain how Power and Bandwidth saving is achieved using SSB system.

(e) Draw PCM Transmitter and Receiver.

(f) Explain the role of AGC and Ganged tuning in AM reception.

2   (a) Explain Medium power AM modulator circuit with its waveform.   20

    (b) Explain FET Reactance modulator for FM generation

3   20

(a) Explain Delta modulation transmitter and receiver with the help of neat block diagram. Also explain Slope overload distortion and Granular noise.

(b)The voice signal in a PCM system is quantised in 16 levels with the following probabilities.

$P_1=P_2=P_3=P_4=0.1$, $P_5=P_6=P_7=P_8=0.05$,

$P_9=P_{10}=P_{11}=P_{12}=0.075$, $P_{13}=P_{14}=P_{15}=P_{16}=0.025$.Calculate the Entropy and information rate.Assume $f_m=3khz$

4   (a) Draw and Explain the Balance slope detection circuit. Also explain   20
        the Distortions in it.

    (b) Explain regarding DPSK (i) Transmission (ii) Reception (iii) waveform for data bit sequence   b(t) = 1011001. Also plot frequency spectrum .

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5   An error control code has the following parity check matrix   20

$$H = \begin{bmatrix} 101100 \\ 110010 \\ 011001 \end{bmatrix}$$

1) Determine the generator matrix(G)

2) Find the code word that begin with 101

3) Decode the received code word 110110. Comment on the error detection capability of the code.

(b) Draw the TRF receiver and give disadvantages of TRF receiver. Also explain Superhetrodyne receiver

6   Write short notes on (any two)   20

Optical Fiber Communication

Pre-Emphasis and De-Emphasis.

Advantages of Digital Communication Systems