# 17318

*Instructions* –  (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

1.  a)  **Attempt any SIX of the following:**                12

   i)   Define the r.m.s. value of an alternating current.

   ii)  Define the bandwidth of a series resonant circuit and give the expression of the same.

   iii) Explain the purpose of four wires in three phase four wire option..

   iv)  Draw voltage waveform of a 3-phase ac supply w.r.t. time.

   v)   Draw a star connected 3 phase load and show line voltages and phase voltages on it.

**Marks**

vi) State any two methods for reducing the starting current of induction motor.

vii) For reversing the direction of rotation of rotor of induction motor, what changes has to be done in the supply system ?

viii) State four types of wires used for wiring of an electrical installation.

b) **Attempt any TWO of the following:** 08

   i) Explain the meaning of in phase voltages and out of phase voltages with the help of waveform diagrams and phasor diagram.

   ii) State the Faraday's laws of electromagnetic induction and give the expression for the induced emf with the meaning of each term.

   iii) State the types of single phase induction motor. Explain working of any one with a neat diagram.

2. **Attempt any FOUR of the following:** 16

   a) Consider R-L series circuit connected across an a.c. voltage v = Vmsinwt. Write expression for instaneous current, phasor diagram, voltage triangle and power consumed.

   b) Explain the concept of impedance and impedance triangle.

   c) State the different types of power in A.C. circuit. Write the expression and units for the same.

   d) Explain the meaning of resonance in series R.L.C. circuit. Derive expression of resonant frequency in R.L.C. series circuit.

   e) Explain three phase balanced load and unbalanced load.

   f) Compare two winding transformer with auto-transformer. (any four points)

**3.**    **Attempt any FOUR of the following:**                **16**

a)  Define and explain the meaning of Q-factor and give the mathematical expression for Q factor in RLC series circuit.

b)  The voltage and current equations in an A.C Circuit are

$V = 140\sin 314t$ and $i = 3\sin\left(314t - \dfrac{\pi}{2}\right)$ find the rms value, average value 2 power factor and state the power factor lagging or leading.

c)  A resistance of 25 ohm, inductance of 0.4H and capacitance of 125 microfarads are connected in series to a 230V, 50Hz supply, find the impedance of the circuit, p.f, active power and apparent power.

d)  Explain statically induced emf and dynamically induced emf.

e)  State and explain the Fleming's Right hand rule and Lenz's law for deciding the direction of induced emf.

f)  What is KVA rating of transformer ? Why transformer is rated in KVA.

**4.**    **Attempt any FOUR of the following:**                **16**

a)  A 50Hz voltage of 130V (r.m.s. value) is connected across an R.L series combination of 80$\Omega$ and 0.4H, find the expressions for voltage and current, p.f. and draw the phasor diagram.

b)  A single phase transformer has 375 turns on the input side and 1050 turns on the output side. The transformer is connected to a 400V, 50Hz a.c. supply. The net cross sectional area of care is 40cm$^2$, find the flux density in Tesla and voltage developed across the supply side of the transformer.

c)  "The actual speed of an induction motor can never be equal to the synchronous speed of the motor." Explain why ?

   d) Explain the principle of operation of induction motor.

   e) Explain the stator frequency control method for speed control of induction motor.

   f) Explain the method of making single phase induction motors as self-start motors.

**5.**      **Attempt any <u>FOUR</u> of the following:**      **16**

   a) An R-L-C series circuit has an impedance of $14.28\Omega$. When connected across an a.c. source of supply of 200V and 50Hz. If the resistance of the circuit is $10\Omega$ and inductance is 0.1H find the capacitance of the circuit and the current drawn by the circuit.

   b) Three impedances each of $4\Omega$ resistance, and $4\Omega$ inductive reactance in series are connected in star and the potential difference between a line and neutral terminal is 231 volts, find the phase current, p.f. and the total power drawn.

   c) Explain in brief the constructional features and working of isolating transformer and state its application.

   d) Draw the torque speed characteristics of 3 phase induction motor and explain the same.

   e) Explain how stepper motor rotates in steps.

**Marks**

**6.** **Attempt any <u>FOUR</u> of the following:** **16**

   a) Three resistances each of 30Ω are connected in delta across a 3 phase, 440V, 50Hz supply. Calculate the phase current, line current and the active power of the cct.

   b) A 50 KVA, 1-φ transformer has a full load on loss of 4kW and ironloss of 2 kW. Find the efficiency of the transformer at half and full load at unit power factor.

   c) State two application of each of the following type of transformers.

      i)    Power transformer

      ii)   R. F transformer

      iii)  Pulse transformer

      iv)  A. F. transformer

   d) Explain the working principle and the operation of universal motors.

   e) Explain the working of a servomotor.

   f) Explain the necessity of earthing. State the types of earthing.

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**3 Hours / 100 Marks**