

Scheme – I

Sample Question Paper

Program Name : Electrical Engineering Program Group

Program Code : EE/EP/EU

Semester : Fourth

Course Title : Electric Motors and Transformers

Max. Marks : 70

22418

Time: 3 Hrs.

Instructions:

- (1) All questions are compulsory.
- (2) Illustrate your answers with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Sub-questions in a main question carry equal marks.
- (5) Assume suitable data if necessary.
- (6) Preferably, write the answers in sequential order.

Q.1 Attempt any Five of the following.

10 Marks

- a) State the principle of the dc motor.
- b) Name the parts of the motors that are built of electromagnetic stampings.
- c) State the role played by the winding insulation of transformers.
- d) State the function of the breather in large transformers.
- e) Define the term polarity related to transformers.
- f) State the function of the isolation transformer.
- g) Define an instrument transformer.

Q.2 Attempt any Three of the following.

12 Marks

- a) Suggest the materials for the following parts of motors: i) armature windings, ii) Commutator, iii) Brushes and iv) Outermost body/frame.
- b) Explain the principle of working of an induction motor.
- c) Describe with relevant figures (sketches) the flux variation method for speed control of the DC shunt motors.
- d) Justify using the relevant labeled torque-speed characteristics the use of DC series motors in traction systems.

Q.3 Attempt any Three of the following.

12 Marks

- a) Explain with simple sketch the working of the brushless DC motor.
- b) Derive the EMF equation for the single phase transformer. State the clearly the terms/symbols used therein.
- c) Draw the labeled phasor diagram of the single phase transformer supplying load at leading power factor.
- d) Draw the labeled equivalent circuit of the single phase transformer supplying a load consisting of a series connection of resistance and inductive reactance.

Q.4 Attempt any Three of the following.

12 Marks

- a) Compare the distribution and power transformers on any four points.
- b) Give the criteria for selection of distribution transformer as per IS:10028(part-I).
- c) Explain with neat circuit diagram only the Scott connection scheme for conversion of three phase supply to two phase supply. Name one application of the same.

- d) A 500kVA transformer has iron losses of 2600W and copper losses of 7400W at full load. Calculate its efficiency at $\frac{3}{4}$ full load at unity pf and 0.9 pf lagging.
- e) Describe with simple circuit diagram the working of the single phase welding transformer.

Q.5) Attempt any Two of the following.

12 Marks

- a) A dc series motor draws a current of 44 A at 220 V running at 820 RPM. The armature and field resistances are 0.2 ohm and 0.1 ohm respectively. The total of iron and friction losses at this load condition is 0.5 kW. Determine the armature torque and efficiency of the motor.
- b) Describe with neat labeled circuit diagrams the tests carried out on three phase transformers to identify the corresponding phase winding terminals on primary and secondary sides along with their polarities.
- c) A 600kVA, distribution transformer have copper and iron losses of 5.6 kW and 3.2 kW respectively on full load. The transformer is loaded as shown below

Loading (kW)	Power factor(lag)	No. of hours
500	0.9	08
400	0.8	10
50	0.75	04
No load	--	02

Calculate the all day efficiency.

Q.6) Attempt any Two of the following.

12 Marks

- a) A single phase 2200/440V transformer has the following winding resistances and reactances (referred to respective sides): $R_1 = 0.7\Omega$, $R_2 = 0.011\Omega$, $X_1 = 3.6\Omega$, $X_2 = 0.045\Omega$. The secondary is connected to coil having resistance of 6 Ω and inductive reactance 4 Ω . Calculate secondary terminal voltage and power consumed by the coil.
- b) Justify the need for parallel operation of transformers. State the conditions for successful parallel operation of three phase transformers.
- c) A 40 kVA, single phase transformer with a ratio of 2000 V / 250 V has a primary resistance of 1.15 Ω and a secondary resistance of 0.01555 Ω . If the transformer is designed for maximum efficiency at 85% of full load. Find its efficiency when delivering full load at 0.9 power factor lag.

Scheme – I

Sample Test Paper - I

Program Name : Electrical Engineering Program Group

Program Code : EE/EP/EU

Semester : Fourth

Course Title : Electric Motors and Transformers

Max. Marks : 20

22418

Time: 1 Hour

Instructions:

- (1) All questions are compulsory.
- (2) Illustrate your answers with neat sketches wherever necessary.
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- (5) Assume suitable data if necessary.
- (6) Preferably, write the answers in sequential order

Q.1 Attempt any FOUR.

08 Marks

- a. Define an electric motor.
- b. Name two materials used for construction of stator cores of motors.
- c. State the function of the magnetic poles in DC machines.
- d. State Fleming's left hand rule.
- e. Write the voltage equation for the DC motor.
- f. Suggest the DC motor for traction applications with justification.

Q.2 Attempt any THREE.

12 Marks

- a. Explain the significance of back emf for proper working of the DC motors.
 - b. Justify the need for starters for DC series and shunt motors.
 - c. Explain the function of the commutator in DC generators and motors. Draw a simple sketch showing its components.
 - d. State the materials used for the following parts of motors: terminal plates, terminal box, yoke and eye bolt.
 - e. Describe with diagram the armature voltage variation method for speed control of DC motor.
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Scheme – I

Sample Test Paper - II

Program Name : Electrical Engineering Program Group

Program Code : EE/EP/EU

Semester : Fourth

Course Title : Electric Motors and Transformers

Max. Marks : 20

22418

Time: 1 Hour

Instructions:

- (1) All questions are compulsory.
- (2) Illustrate your answers with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Sub-questions in a main question carry equal marks.
- (5) Assume suitable data if necessary.
- (6) Preferably, write the answers in sequential order

Q.1 Attempt any FOUR.

08 Marks

- a. Name two materials used for the cores of transformers.
- b. State the reason for the transformer rating to be mentioned in kVA.
- c. Justify need for cooling of transformers.
- d. Write the need for parallel operation of transformers.
- e. Justify the need for using isolation transformers in some applications.
- f. Write in brief (4 sentences) the effects of harmonics on operation of transformers.

Q.2 Attempt any THREE.

12 Marks

- a. A 3300/230V, 50Hz single phase transformer is to be operated at a maximum flux density of 1.2Wb/m^2 in the core. The effective cross sectional area of the transformer is 150cm^2 . Calculate suitable values of primary and secondary turns.
 - b. Draw the phasor diagram of a single phase transformer loaded at leading power factor.
 - c. Explain with diagrams the polarity and phasing out tests on three phase transformers.
 - d. State the criteria for selection of power transformers.
 - e. Explain the working of the pulse transformer and name two applications for the same.
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