

# 17415

**11920**

**3 Hours / 100 Marks**

Seat No.

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- 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) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

- 1. Attempt any TEN of the following:** **20**
- a) Poles of DC machines are always laminated. Justify it.
  - b) State different parts of DC machines (Any four)
  - c) State atleast four applications of DC series motor.
  - d) Draw a neat connection diagram of dc shunt motor showing the direction of all the currents.
  - e) DC series motor should never be started at no load. Justify.
  - f) State significance of back e.m.f.
  - g) List the characteristics of an ideal transformer.
  - h) A 50 KVA transformer has 800 watts of iron loss on full load. Calculate it iron loss at 40% of full load.
  - i) Draw phasor diagram for practical transformer on NO load.
  - j) Draw circuit diagram for polarity test on 1 $\phi$  transformer.
  - k) State any two advantages of three phase transformer over bank of single phase transformer.

P.T.O.

- l) Give the criteria for selection of distribution transformer as per IS : 10028 (part-I) 1985.

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

**16**

- a) Derive emf equation of DC generator.
- b) A 120V DC shunt motor having an armature circuit resistance of  $0.2\Omega$  and field circuit resistance of  $60\Omega$ , draws a line current of 40A at full load, the brush voltage drop is 3V and rated full load speed is 1800 RPM calculate
- (i) the speed at half load
- (ii) the speed at 125% full load.
- c) A DC series motor takes 40A at 220V and runs at 800 RPM. If the armature and field resistances are  $0.2\Omega$  and  $0.1\Omega$  respectively and iron and friction losses are 0.5 KW. Find armature torque and efficiency of the motor.
- d) Draw the connection diagram of different types of DC generators.
- e) Describe Ta-Ia characteristic for DC series and shunt motor.
- f) Describe the reason of using DC series motor for electric trains.

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

**16**

- a) Draw phasor diagram for
- (i) Idat transformer.
- (ii) Practical transformer on No. load & ON load.
- b) Derive the emf equation of transformer.
- c) Draw the complete phasor diagram of a transformer at a load of 0.8 Pf lag.
- d) A 10 KVA single phase transformer for 2000/400 V at no load, has  $R_1 = 5.5\Omega$ ,  $X_1 = 12\Omega$ ,  $R_2 = 0.2\Omega$ ,  $X_2 = 0.45\Omega$ . Determine the approximate value of the secondary voltage at full load, 0.8 power factor. (lagging), when the primary applied voltage is 2000V.

- e) Describe any two methods of transformer cooling.  
 f) Compare auto transformer with two winding transformer.

4. Attempt any FOUR of the following:

16

- a) The max flux density in the core of 250 / 3000V, 50 Hz 1 $\phi$  transformer is 1.2 wb/m<sup>2</sup>. If emf/turn is 8V, determine area of core and primary and secondary turns.  
 b) A 500 KVA distribution transformer having copper and iron losses of 6 KW and 5 KW respectively on full load, the transformer is loaded as shown below. Calculate all day efficiency.

Loading (KW)	Power factor (lag)	No. of Hrs
400	0.8	06
300	0.75	12
200	0.8	04
No load	—	02

- c) Identify the circuit diagram given in Figure No. 1. Select proper range of all meters if the transformer is having rating of 220/110V, 1KVA.

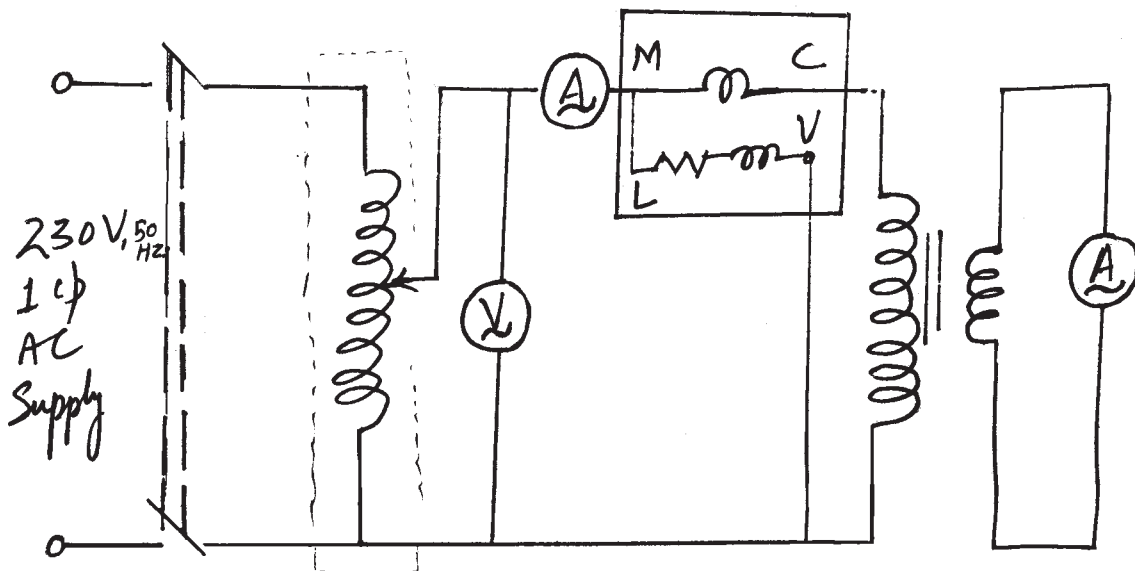


Figure No. 1

- d) Derive the equation for condition of max efficiency.
- e) State the advantages of parallel operation of transformer.
- f) The efficiency of a 100 KVA 11000 / 440V, 1 $\phi$  transformer is 87% on half load at 0.8 (lag) and 89% on full load at unity Pf Determine iron and copper losses.

**5. Attempt any FOUR of the following:**

**16**

- a) Explain why rating of a transformer is in KVA and not in KW.
- b) 'OC' test is performed on HV winding and 'SC' test is performed on LV winding of a transformer. Justify.
- c) A 20 KVA, 1000/250V, 50 Hz, 1 $\phi$  transformer have the following test results.  
OC test (with LV open) : 1000V, 2A, 250 W  
SC test (with HV open) : 5V, 50A, 200 W  
Calculate the efficiency of this transformer at half and full load 0.8 Pf lagging.
- d) For Delta Star connection of 3 ph transformer
  - (i) Draw the connection diagram.
  - (ii) List any two advantages of this connection
  - (iii) State its area of application.
- e) Draw the vector diagram and calculate its phase shift for the following vector groups.
  - (i) DYS
  - (ii) Dd6
- f) Explain construction and working of isolation transformer.

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

- a) Two single phase transformer of 250 KVA each are operated on parallel (Both side) their % drops are  $(1 + j6)\Omega$  and  $(1.2 + j4.8)\Omega$ . The load connection across the bus bar is 500 KVA at 0.8 Pf Calculate load share by each transformer.
  - b) The efficiency of a 20 KVA, 2500 / 250 V, single phase transformer at unity power factor is 98% at rated load and also at half rated load. Determine
    - (i) Transformer core loss
    - (ii) Full load copper loss
    - (iii) per unit value of the equivalent resistant of the transformer.
  - c) Explain with the circuit diagram use of potential transformer.
  - d) Describe any two functions of isolation transformer.
  - e) Describe working of welding transformer.
  - f) C-T. should never be operated its secondary winding open circuited. Justify this statement.
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