



KC-6129
B. E. - II (Sem. III) (Chemical) Examination
November / December – 2012
Electrical Technology

Time : Hours]

[Total Marks : 100

Instructions :

(1)

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| <p>नीचे दृष्टावेक निशानीवाणी विगतो उत्तरवडी पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.</p> <p>Name of the Examination : B. E. - 2 (SEM. 3) (CHEMICAL)</p> <p>Name of the Subject : Electrical Technology</p> <p>Subject Code No. : 6 1 2 9 Section No. (1, 2,.....): Nil</p> | <p>Seat No. : □ □ □ □ □ □</p> <p style="text-align: center;">Student's Signature</p> |
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- (2) Figures on right hand side indicate full marks.
- (3) Assume suitable data wherever necessary.
- (4) Attempt all questions.

1 (a) Fill in the blanks :

10

- (1) The principle of operation of a transformer is based upon _____ induction.
- (2) Ideally voltage regulation in a transformer should be _____ %.
- (3) Maximum regulation of transformer occurs when power factor of the load is _____.
- (4) The laminated core is used in a transformer in order to reduce _____ loss.
- (5) An 80 MVA, 400 Hz transformer is operated at 50 Hz its MVA rating is _____.
- (6) The difference between the synchronous speed and the actual speed of an induction motor is known as the _____.

- (7) In the circle diagram of an induction motor the diameter of the circle represents the _____.
- (8) The no-load current in an induction motor is _____ compared to that of a power transformer.
- (9) The rotor slots in a 3-phase squirrel induction motor are kept inclined. This phenomenon is known as _____.
- (10) The full load slip of a 60 Hz, 12-pole squirrel cage induction motor is 5%. Its full load speed is _____ rpm.
- (b) Draw the circle diagram from no-load and short circuit test of a 3-phase, 400 V, 6-Pole, 50 Hz induction motor from the following test results : 10
 No Load : 400 V, 8 A p.f. = 0.16
 Short Circuit : 200 V, 39 A p.f. = 0.36
 Stator and Rotor Cu losses are equal at standstill.
 From the diagram, Determine the mechanical output, torque and slip when motor draws a current of 30 A from the mains.
- 2 (a) Discuss different methods of speed control of 3-phase Induction motor. 7
- (b) A single phase, 5 KVA 250/500 V, transformer gave the following test results : 8
 OC test (LV side) : 250 V, 0.75 A, 60 W
 SC test (HV side) : 9 V, 6 A, 21.6 W
 Calculate the circuit constants and show them on an equivalent circuit.
- OR**
- 2 (a) Draw a vector diagram with appropriate notations of transformer having following types of different loads : 7
 (1) Purely resistive load
 (2) Lagging power factor load
 (3) Leading power factor load.
- (b) A three phase, six pole, 50 HP, 440 V, 50 Hz induction motor has the following : 8
 Parameters per phase
 $R_1 = 0.25 \Omega, X_1 = 0.25 \Omega, R'_2 = 0.25 \Omega, X'_2 = 0.75 \Omega,$
 $R_0 = 100 \Omega, X_0 = 1000 \Omega$
 The stator core loss is 800 W and rotational losses are 450 W. Calculate input line current and power factor, developed electromagnetic torque, horsepower output, and efficiency at 2.5% slip.

- 3 Attempt any three : 15**
- Explain the construction of a single phase transformer.
 - Compare squirrel cage and slipring induction motor.
 - What are the various losses in an induction motor ?
On what factors do they depend ?
 - A 50 KVA transformer has an efficiency of 98% at full load, 0.8 p.f. and 97% at half load, 0.8 p.f. Determine the full load copper loss and iron loss. Find the load at which the maximum efficiency occurs and maximum efficiency.
 - A 415 V, 3 – phase, 50 Hz induction motor gives 14 KW as the net output under full load. If the rotor current frequency is 2.5 Hz, calculate the slip, rotor copper loss, efficiency of the motor and the line current if the mechanical losses are 920 W, the stator losses are 1500 W and the power factor of the motor is 0.87.
- 4 (a) Fill in the blanks : 10**
- In a synchronous generator, the _____ is always a stationary member and the _____ moving member.
 - In a dc machine _____ and _____ combination makes mechanical rectifier.
 - The compensating winding is placed on _____.
 - For a given load the armature current of a synchronous motor will be minimum for _____ power factor.
 - Interpoles are used in a dc generator to reduce _____ at brushes.
 - In dc machine mechanical losses includes windage loss, bearing friction loss and _____.
 - The maximum torque that a synchronous motor can develop without loss of synchronism is known as _____ torque.
 - By flux control method we can get speeds _____ than the rated speed.
 - The efficiency of synchronous motor is _____ than that of an induction motor of same size and output rating.
 - Synchronous reactance can be defined as sum of _____ and _____ reactance.
- (b) Explain the construction of 3-phase Synchronous machine with neat sketches. 5**

- (c) State and explain methods of speed control for D.C. Shunt Motor. 5
- 5 (a) Explain working principle of DC motor. 3
 (b) Explain various types of D.C. Generators. 5
 (c) A 220 V, dc shunt motor takes 4 A at no load when running at 700 rpm. The field resistance is 100 ohm. The resistance of armature at standstill gives a drop of 6 V across armature terminals when 10 A were passed through it. Calculate : 7
 (a) Speed on load
 (b) Torque in N.m and
 (c) efficiency. The normal input of the motor is 8 kW.
- OR**
- 5 (a) What is armature reaction ? Explain the effect of armature reaction on the terminal voltage of Synchronous machine at : 7
 (i) unity power factor load
 (ii) zero leading power factor load.
 Draw the relevant phasor diagrams.
- (b) A 3-phase star connected, 1000 KVA, 11000 V synchronous machine has rated current of 52.5 A. The ac resistance of the winding per phase is 0.45 ohm. The test result are given below : 8
 OC test : Field current = 12.5 A,
 Voltage between lines = 422 V
 SC test : Field current = 12.5 A, line current = 52.5A
 Determine the full - load voltage regulation of the alternator :
 (a) 0.8 pf lagging and
 (b) 0.8 pf leading.
- 6 Attempt any **three** : 15
 (a) Explain Losses in D.C. Machines
 (b) ZPF method to find out regulation of Synchronous machine.
 (c) Explain signification of V curve and inverted V curve of synchronous motor.
 (d) Explain different parts of D.C. machine
 (e) Explain the principle of operation of synchronous motor.