Jharkhand University of Technology, Ranchi

B.Tech. 2nd Semester Examination, 2019

Subject : Basic Electrical Engineering **Subject Code : ESC-101**

Time Allowed : 3 Hours **Full Marks : 70**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer any five *questions.*

1. Choose the correct answer: 2×7=14

(i) You have to replace 1500Ω resistor in radio. You have no 1500Ω resistor but have several 1000Ω ones which you would connect

(a) two in parallel.

(b) two in parallel and one in series.

(c) three in series.

(d) three in parallel.

(ii) In any AC circuit always

(a) apparent power is more than actual power.

(b) reactive power is more than apparent power.

(c) actual power is more than reactive power.

(d) reactive power is more than actual power.

(iii) Power factor of an inductive circuit is usually improved by connecting capacitor to it in

(a) parallel

(b) series

(c) Either (a) or (b)

(d) None of the above

(iv) A 3 phase 440V, 50 Hz induction motor has 4% slip. The frequency of rotor emf will be

(a) 200 Hz

(b) 50 Hz

(c) 0.2 Hz

(d) 2 Hz

(v) A transformer core is laminated to

(a) reduce hysteresis loss.

(b) reduce eddy current losses.

(c) reduce copper loss.

(d) reduce all above losses.

(vi) A star connected load has three equal impedance each of $(40 + j30)\Omega$. If the line current is SA then value of line voltage is

(a) 250 volt

(b) $\frac{250}{\sqrt{3}}$ volt

(c) $250\sqrt{3}$ volt

(d) 200 volt

(vii) The main function of a fuse is to

(a) protect the line.

(b) open the circuit.

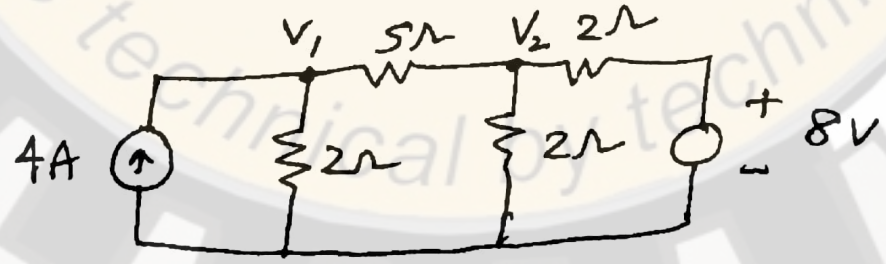
(c) protect the appliance.

(d) prevent excessive currents.

Or,

(a) State and explain superposition theorem.

(b) For the following circuit find V_1 and V_2 using superposition theorem. 6+8=14



2. (a) State and explain Thevenin's and Norton's theorem.

(b) Find the Thevenin's equivalent and Norton's equivalent across *ab* of the circuit given below: 6+8=14

3. (a) Explain about 3 phase balanced and unbalanced load.

(b) Establish the relationship between line voltage and phase voltage for star connection.

(c) A two element series circuit consumes 700W and has a power factor 0.707 leading. If applied voltage is $v(t) = 141.4\sin(314t + 30°)$ volt, find the circuit constant. 2+5+7=14

4. (a) Explain principle of operation of a transformer. Derive the expression for the emf induced in a transformer.

(b) A 100 kVA, 2200/440V single phase transformer has $r_1 = 0.3\Omega$, $x_1 = 1.1\Omega$
$r_2 = 0.01\Omega$, $x_2 = 0.035\Omega$

Calculate: (i) The equivalent impedance of the transformer referred to primary side.

(ii) Total copper loss. 7+7=14

5. (a) Explain working principle of a 3 phase induction motor. Discuss the torque slip characteristics of the motor.

(b) A 3 phase 50 Hz, 4 pole induction motor has a slip of 4%, calculate speed of the motor, frequency of rotor emf. If the rotor has a resistance of 1Ω and standstill reactance of 4Ω. Calculate the power factor of the rotor (i) at standstill and (ii) at a speed of 1400 rpm. 7+7=14

6. (a) Explain B–M characteristics of a magnetic material.

(b) Describe regulation and efficiency of a transformer.

(c) Explain different methods of speed control of 3-phase induction motor.

(d) Explain the construction of synchronous generator.

(e) Why earthing is done? 3+3+3+3+2=14

7. Write short notes on *any three* of the following: 4+5+5=14

(a) Time domain analysis of RL circuit

(b) Starting methods of 3 phase induction motor

(c) Auto transformer

(d) Equivalent circuit of a single phase transformer

(e) DC/DC Buck-Boost converter