CS/B.Tech/Even/2nd Sem/ES-201/2014

# 2014

# Basic Electrical and Electronics Engineering

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

*The figure in the margin indicate full marks.*
*Candidates are required to give their answers in their*
*own words as far as practicable*

## GROUP - A
### ( Multiple Choice Type Questions )

1. Choose the correct alternative for any *five* of the following: 1x5=5

    i)   The dielectric strength of an insulating material is expressed in

        a) $\mu F / m$          b) KV/m

        c) $KV / \mu F$          d) none of them

    ii)  When the plate area of a parallel plate capacitor is increased keeping the capacitor voltage constant, the force between the plate

        a) increases
        b) decreases
        c) remains constant
        d) may increases or decreases depending on the metal

    iii) A series motor drawing armature current Ia is operated under

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saturation condition. The torque will be proportional to

a) $1/I_a$
b) $1/I_a^2$
c) $I_a^2$
d) $I_a$

iv) The D.C motor used for traction purpose is

a) Shunt
b) Series
c) Compound
d) None of these

v) In a transformer zero voltage regulation at full load is

a) not possible
b) possible at unity power factor load
c) possible at leading power factor load
d) possible at lagging power factor load

vi) Can a 50Hz transformer be used for 25Hz with input voltage rated for 50 Hz

a) Yes, as V, I remains constant
b) No, the flux is doubled which will drive the core to excessive saturation
c) No, the current will become double
d) Yes, at constant voltage insulation will not be over stressed.

vii) Three $50\Omega$ resistances are connected in star across a 400V, $3 - \Phi$ supply. If one of the resistances is disconnected, the line current will be

a) 8A
b) 4A
c) $8\sqrt{3}$
d) $8/\sqrt{3}$

## GROUP - B

## ( Short Answer Type Questions )

Answer any *two* questions:

2x5=10

2. Draw a general single line diagram from power generation to distribution.

3. Proof that for a balanced start connected supply system connected

to a balanced star connected load, the current through the neutral wire is zero.

4. Show that for a single phase transformer, $E_p = 4.44f\Phi_m N_p$ where the symbols have their usual meanings.

5. Explain how the speed of a D.C shunt motor can be controlled by flux control method.

## GROUP - C

## ( Long Answer Type Questions )

Answer any *three* questions:  2x10=20

6.a) Derive the emf equation of DC generator.  (4)

b) A 120V D.C Shunt Motor having an armature resistance of $0.2\Omega$ and field resistance of 60 $\Omega$, draws a line current of 40A at full load. The brush voltage drop is 3V and the rated full load speed is 1800rpm. Calculate the speed at half load and 125% of full load.  (6)

7.a) Draw the phasor diagram of a single phase transformer under no load condition.  (4)

b) The efficiency at unity power factor of a 6600/384v, 200KVA single phase transformer is 98% both at full load and at half load. Calculate the full load Cu Loss and Core Loss.  (6)

8. Explain the 2-Wattmeter method of power measurement for a $3 - \Phi$ balanced load. Draw the necessary phasor diagrams. Also show how the power factor can be measured from this method. (6+4)

9.a) Obtain the condition for maximum torque for a $3 - \Phi$ induction motor.

b) The power input to a 400V, 6 poles, 50Hz, $3 - \Phi$ induction motor running at 975 rpm is 40 KW. The Stator losses are 1KW and Friction and windage losses are 2KW. Find the efficiency of the motor.  (4+6)

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# 2014

## Basic Electrical and Electronics Engg(Part - II)

*Time Alloted : 3 Hours*                    *Full Marks : 35*

*The figure in the margin indicate full marks.*
*Candidates are required to give their answers in their*
*own words as far as practicable*

### GROUP - A
### ( Multiple Choice Type Questions )

1. Choose the correct answer for the following: (any five )
1x5

   i)    The decimal equivalent of binary 11.1 is

   a) 3.5  b) 3.1  c) 5.1  d) 2.2

   ii)    Open loop voltage gain of an op-amp is

   a) Small  b) Large  c) can be anything

   iii)    Which of the following devices has highest input impedance

   a) MOSFET  b) BJT  c) JFET

   iv)    CMRR of an op-amp

   a) much larger than unity   b) much smaller than unity

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c) Unity                    d) None of these

v)    Which of the following feedback topologies offers high input impendance?

a) Voltage Series  b) Voltage Shunt  c) Current Series  d) Current Shunt

vi)   Oscillators use following feedback :

a) Negative  b) Positive  c) Both Negative and Positive  d) None

## GROUP - B
### ( Short Answer Type Questions )
Answer any *two* questions        2X 5=10

2.   Draw and explain the working pronciple of CMOS inverter circuit.

(5)

3.   What is positive feedback?Name the different feedback topologies.

(2 + 3)

4.   Identify the circuit and find out the output voltage $V_0$ of the circuit if

$v_{in}$ = 5 sin 2000πt m V, R = 100k Ω and C = 1μ F.   1+4



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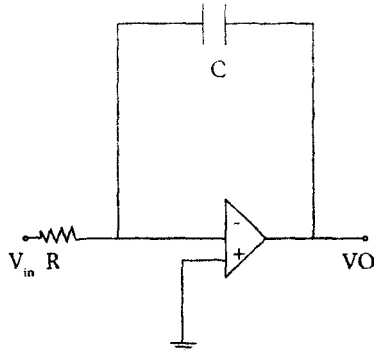
5.a) Perform the following number conversions

i) $(ABC)_{16} = (?)_2$

ii) $(195)_8 = (?)_2$

b) Realize the Boolean expression using minimum number of NAND gates

$$Y = (\overline{A} + \overline{B})(\overline{A} + \overline{B})$$

3+2

# GROUP - C
## ( Long Answer Type Questions )
### Answer any *two* questions  2X10=20

6. a) In a J-FET for an applied $V_{GS} = 0V$ and $V_{DS} = 2.5 V$ the drain current appears to be 13.5 mA/ What is the value of $I_{DSS}$ here?If $V_{DS}$ is increased to 3V and the pinch - off voltage is stated -2V .What is the value of $I_D$   5

b)   What is know as Gain-bandwidth product of an amplifier?State the Barkhausen Criteria.   5

7. a) What are integrator and differentiator?Describe it with suitable block  diagram.

b) The midrange open-loop gain of a certain op-amp is 120dB. Negative feedback reduces this gain by 50dB.What is the closed loop gain?

5+5

8. a) Define the truth table of XOR gate.Implement the XOR operation using the minimum number 2- input NAND gate.   4+1

b) If in an adder 3 Input resistances are 2KΩ, 4 KΩ, and 8 KΩ and the feedback resistance is 10 KΩ. What is the output voltage of the OP-Amp   5

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9. Write short notes of any two of the following:       2X5 = 10

   a) MOSFET

   b) Feedback Amplifier

   c) Universal gates

   d) Operational Amplifier

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