BASIC ELECTRICAL ENGINEERING (SEMESTER - 2)

CS/B.Tech/SEM-2/EE-201/09
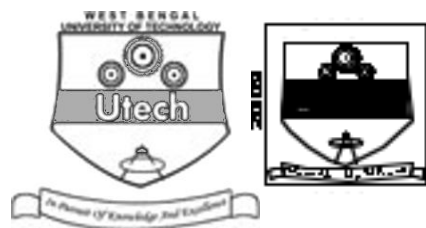
1. ....
   Signature of Invigilator

2. ....
   Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | | |

CS/B.Tech/SEM-2/EE-201/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
BASIC ELECTRICAL ENGINEERING (SEMESTER - 2)

Time : 3 Hours]   [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.

2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.

   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.

3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.

4. Read the instructions given inside carefully before answering.

5. You should not forget to write the corresponding question numbers while answering.

6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.

7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**

8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.

9. Rough work, if necessary is to be done in this booklet only and cross it through.

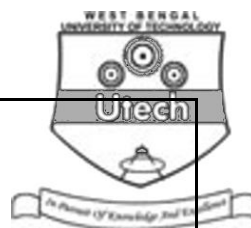### No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY
Marks Obtained

			Group – A						Group – B		Group – C			Total Marks	Examiner's Signature
Question Number															
Marks Obtained															

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Head-Examiner/Co-Ordinator/Scrutineer

| **2202 (03/06)** |

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ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

BASIC ELECTRICAL ENGINEERING
SEMESTERS - 2

Time : 3 Hours]   [Full Marks : 70

GROUP – A
(Multiple Choice Type Questions)

1.   Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i)   The slip of 400 V, 3-phase, 50 Hz, 4-pole induction motor when rotating at 1440 *r.p.m.* is

a)   2%

b)   3%

c)   4%

d)   5%

e)   none of these.

ii)   A sinusoidal voltage is represented by

$v = 141 \cdot 4 \sin (314t - \pi/2)$. The frequency is

a)   60 Hz   b)   50 Hz

c)   100 Hz   d)   none of these.

iii)   The number of parallel paths in an 8-pole D.C. generator is

a)   8   b)   4

c)   2   d)   16.

iv) In a series R-L-C circuit, the power factor at resonance is

    a)   unity   b)   zero

    c)   0·5   d)   none of these.

v) The transformer core is laminated to reduce

    a)   copper loss   b)   eddy current loss

    c)   hysteresis loss   d)   none of these.

vi) The direction of rotation in *D.C.* motor can be determined by

    a)   Lenz's law   b)   Fleming's right hand rule

    c)   Fleming's left hand rule   d)   None of these.

vii) The unit of magnetic flux density is

    a)   weber   b)   tesla

    c)   coulomb   d)   none of these.

viii) The time constant of an R-C series circuit is equal to

    a)   R/C   b)   C/R

    c)   RC   d) $\dfrac{1}{RC}$.

ix) In a transformer, electric power is transformed from the primary to the secondary without the change in

    a)   voltage   b)   current

    c)   frequency   d)   turns

    e)   none of these.

x) The conductance G of a series circuit having a resistance R and inductive reactance, X_L is given by

a) $G = \dfrac{1}{R}$

b) $G = \dfrac{R}{X_L}$

c) $G = \dfrac{X_L}{R^2 + X_L^2}$

d) $G = \dfrac{R}{R^2 + X_L^2}$.

xi) A resistance of $8 \cdot 0$ Ω and an inductive reactance of $6 \cdot 0$ Ω will offer an impedance of

a) 14 Ω

b) 10 Ω

c) 11 Ω

d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) State Gauss' Law.

   b) Three equal charges each of magnitude $3 \cdot 0 \times 10^{-6}$ C are placed at three corners of a right-angled triangle of sides 3 cm and 4 cm. Find the force on the charge at the apex corner if 4 cm side is the base of the triangle. $2 + 3$

3. Derive the *e.m.f.* equation of D.C. machines.

4. What is mutual inductance ? Derive an expression of co-efficient of coupling involving self inductances L_1 and L_2 and mutual inductance M. $2 + 3$

5. Draw an analogy between electric circuit and magnetic circuit.

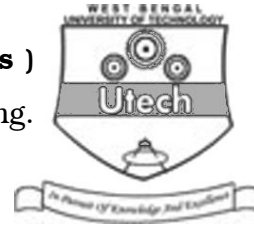6. State and prove Maximum power transfer theorem.

GROUP – C

(**Long Answer Type Questions**)

Answer any *three* of the following. $3 \infty 15 = 45$

7. a)   State and explain Superposition theorem.

    b)   Find the current through 5 Ω resistor using Thevenin's theorem in figure

    below :

    dia.

                                                                $5 + 10$

8.   A circuit takes a current of 3 A at a power factor of 0·6 lagging when connected to a

    115 V, 50 Hz supply. Another one circuit takes a current of 5 A at a power factor of

    0·707 leading when connected to the same supply after the first circuit is removed. If

    the two circuits are connected in series across a 230 V, 50 Hz supply, calculate

    (a) the current drawn from the source   (b) the power consumed (c) the power factor

    of the circuit.

9.   a)   Derive the expression for the torque developed in *D.C.* motor.

    b)   A 4-pole, 240 V *D.C.* shunt motor has armature and shunt field resistances of

    0·24 Ω and 240 Ω respectively. It takes 20 A at 240 V while running at a speed of

    1000 *r.p.m.* Find (i) field current (ii) armature current (iii) back *e.m.f.* (iv) torque

    developed. $5 + 10$

10. a) How will you measure the power consumed by a balanced star connected three-phase circuit with two wattmeters ? Draw the circuit and derive necessary relation.

    b) A three-phase 230 V load has a power factor of 0·7. Two wattmeters are used to measure power which shows the input to be 10 kW. Find the reading of each wattmeter. 8 + 7

11. a) Prove that, the efficiency of the transformer is maximum when iron loss is equal to the copper loss.

    b) A 75 kVA transformer has 500 turns in the primary and 100 turns in the secondary. The primary and secondary resistances are 0·4 Ω and 0·02 Ω respectively and corresponding leakage reactances are 1·5 Ω and 0·045 Ω respectively. The supply voltage is 6600 volt.

    Calculate,

    i) equivalent impedance referred to the primary

    ii) equivalent impedance referred to the secondary

    iii) the voltage regulation at power of 0·8 lagging. 5 + 10

END