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WEST BENGAL UNIVERSITY OF TECHNOLOGY

ES-201

BASIC ELECTRICAL & ELECTRONIC ENGINEERING - II

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

PART-I(Electrical)
(Used blue color answer book for this part)
GROUP A
(Multiple Choice Type Questions)

1. Answer any *five* questions. $5 \times 1 = 5$

(i) The output voltage of a dc generator is

(A) ac square wave (B) ac sinusoidal wave
(C) pulsating dc (D) pure dc

(ii) In a transformer, the flux phasor

(A) leads the induced emf by 90°
(B) lags the induced emf by 90°
(C) leads the induced emf by slightly less than 90°
(D) lags the induced emf by slightly less than 90°

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(iii) When a 50 Hz transformer is operated at 400 Hz, its KVA rating is

(A) increased by 8 times
(B) reduced by 8 times
(C) unaffected
(D) determined by load on secondary

(iv) Two wattmeters are connected to measure the input to a balanced three phase circuit. The readings of the instruments are W_1 & W_2 respectively. The currents lag by an angle θ behind the corresponding phase voltages

(A) if $\theta = 0°$, $W_1 > W_2$
(B) if $\theta < 60°$ both W_1 & W_2 are positive
(C) if $\theta = 30°$, $W_2 > 0$
(D) for $\theta > 60°$, W_1 is positive

(v) Power developed by dc motor is maximum when the ratio of back emf & applied voltage is

(A) double (B) zero
(C) unity (D) half

(vi) The critical resistance of a dc generator refers to the resistance of

(A) load (B) brushes
(C) field (D) armature

GROUP B
(Short Answer Type Questions)

Answer any *two* questions. $2 \times 5 = 1$

2. Draw the exact equivalent circuit of a transformer & describe briefly the various parameters involved in it.

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3. Find an expression of electric field intensity and electric potential of an isolated point charge.

4. Show that the power in a three phase circuit can be measured using 2 wattmeters.

5. What is slip? Deduce a relationship between rotor current frequency & supply frequency in terms of slip of an induction motor.

GROUP C
(Long Answer Type Questions)

Answer any *two* questions. $2 \times 10 = 20$

6. (a) Why is the open circuit test on a transformer conducted at a rated voltage? Explain. 3+7
   (b) A 20 KVA, 2000/200V single phase transformer has a primary resistance of 2.1Ω and a secondary resistance of 0.02Ω. If the total iron loss equals 200W, find the efficiency on (i) full load & a p.f of 0.5 lagging (ii) half load & a p.f of 0.8 leading.

7. (a) What is meant by back emf? Explain the principle of torque production in a dc motor. 5
   (b) A dc motor takes an armature current of 100A at 230V. The armature resistance is 0.05Ω. The total number of lap connected armature conductors are 500 & the number of poles is 4. The flux per pole is 0.03wb. Find the speed & torque. 5

8. (a) "A rotating field is created in a three phase induction motor when a balanced three phase ac supply is applied at the stator". Explain. 5

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   (b) A three phase 4 kw, 400V, 50Hz, induction motor is working at full load with an efficiency of 90% at a power factor of 0.8 lagging. Calculate (i) the input power (ii) the line current. 5

9.(a) In a three phase four wire power distribution system, phase B is open while current through R & Y are $100 \angle -30$ & $60 \angle 60°$. Find the current through the neutral connection. 4
   (b) Three equal charges each of magnitude 3.5×10^{-6} C are placed at three corners of a right angled triangle of sides 3cm, 4cm, 5cm. Find the force on the charge at the right angle corner. 6

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