S2028

Scheme/Answer Key for Valuation

Scheme of evaluation(marks in brackets) and answers of problems/key

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE100

Course Name: BASICS OF ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

1. KCL statement & explanation – (2 marks)
   KVL statement & explanation – (2 marks)

2. Any 4 comparisons – 4 marks

3. I=Im/(√2) – (1 mark)
   Answer : RMS Value I=10.61A – (1 mark)
   I_{av}=2Im/π – (1 mark)
   Answer : Average value I_{av} =9.55A – (1 mark)

4. Phase angle: I lags V by 90º – (1 mark)
   Proof:
   starting from v= $V_m$sin (ωt) and deriving i= $I_m$sin (ωt-90º) – (3 marks)

5. Four points – (4 marks)
6. Primary transmission: (2 marks)
   Secondary transmission: (2 marks)
7. principle of operation (4 marks)
8. back e.m.f. explanation (3 marks)
   Voltage equation (1 mark)
9. Ns = $\frac{120f}{P}$ (1 mark)
   Ns=1000 rpm (1 mark)
   N = (1-s) Ns (1 mark)
   N= 980 rpm (1 mark)

10. Diagram – (1 mark)

Working – (3 marks)

PART B

11. Applying KCL at node 1, (3 marks)

(V1-60)/20+(V1-V2)/30=1

Applying KCL at node 2, (3 marks)

(V2-V1)/30+(V2-40)/50+V2/100=0

V2=48V (2 marks)

Current through 100 ohm resistor =V2/100 =0.48A (2 marks)

(note : If the candidate has found the node voltage equation in matrix form, then also 6 marks should be given. It is not mandatory that the student should show the derivation of the equations using KCL)

12. a) $B_g = 0.4$ Wb/m^2 $\mu_r = 400$ $l_g = 6 \times 10^{-3}$m $A = 12 \times 10^{-4}$ m^2 $l_i = 60 \times 10^{-2}$ m

$\Phi = B_gA = 0.4 \times 12 \times 10^{-4} = 4.8 \times 10^{-4}$ Wb (2 marks)

$S = S_g+S_i = (l_i/\mu_0\mu_rA)+ (l_g/\mu_0A) = [(60 \times 10^{-2})/(4 \times \pi \times 10^{-7} \times 400 \times 12 \times 10^{-4})] +$

$[(6 \times 10^{-3})/(4 \times \pi \times 10^{-7} \times 12 \times 10^{-4})] = 497.3 \times 10^4$ AT/ Wb (2 marks)

$Mmf = S \times \Phi = 497.3 \times 10^4 \times 4.8 \times 10^{-4} = 2387.04$ AT (2 marks)

b) Energy derivation (4 mark)

13.

(i) Star

phase voltage $V_{ph} = V_L/\sqrt{3} = 239.6$V - (1 mark)

phase current $I_{ph} = V_{ph}/Z = 32.2$A - (1 mark)

power factor = R/Z= 0.538 - (1 mark)

$P = 3 V_{ph} I_{ph} \cos \phi = 12.4$ kW - (2 marks)

(ii) Delta

phase voltage $V_{ph} = V_L = 415$V - (1 mark)

phase current = $I_{ph} = V_{ph}/Z = 55.78$A - (1 mark)

power factor = R/Z= 0.538 - (1 mark)

$P=3\ V_{ph}\ I_{ph} \cos \phi = 37.3$ kW - (2 marks)

14. a)

(i) $X_L =$ 100ohm – (1 mark)

(ii) L=0.318 H – (1 mark)

(iii) P=0 (purely inductive coil) – (1 mark)

(iv) v=311.13 sin (314t) – (1 mark)

i=3.11 sin (314t-90º) – (1 mark)

b) Circuit diagram with line and phase voltages and currents labelled – (1 mark)

Phasor diagram – (1 mark)

Solving to find I_L – (1 mark)

$I_L = \sqrt{3} I_{ph}$ – (1 mark)

$V_L = V_{ph}$ – (1 mark)

15. Block diagram: (4 marks)

Explanation : (6 marks)

16. Five marks each

17. a) Construction – (3 marks)

Working – (2 marks)

b) Equation for Eg - (1 mark)

Eg=2000V –(4 mark)

18. η = output/(output +losses) = kVA *pf/(kVA* pf+ W_{cu} +W_i) (4 marks)

(a) 96.1% (6 marks)

(According to the syllabus, the students have to study the equation of full load efficiency and application of the same in numerical. Hence part (b) and (c) can be neglected.)

19. a) Constructional details of squirrel cage -(5 marks)

b) Constructional details of slip ring - (5 marks)

20. Circuit Diagram (3 marks)

Explanation (3 marks)

Comparison with split-phase motor (3 marks)

one application (1 marks)

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