APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Scheme for Valuation/Answer Key

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

FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019

Course Code: EE100

Course Name: BASICS OF ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

1. KCL statement & example – 2 marks
   KVL statement & example – 2 marks
2. 1 mark each for the definitions (1x4= 4 marks)
3. Four Definitions - 1 mark each (1x4= 4 marks)
4. (i) $v=230\sqrt{2}\sin(\omega t)$ or $v= 325.27\sin(\omega t)$ – 1 mark
   (ii) $i=(230\sqrt{2}/10)\sin(\omega t-30^o)$ or $i= 32.527\sin(\omega t-30^o)$ – 1 mark
   (iii) $P=VI\cos\phi = 4581.27$ W – 2 marks
5. Merits: 2 marks
   Demerits: 2 marks
6. Four points (4 marks)
7. working principle of DC generator (4 marks)
8. Construction – (4 marks)
9. constructional details – 4 marks
10. Comparison 4 points 4 marks

PART B

11. Applying KVL to mesh 1,
    $-10I_1-10(I_1-I_3)-10(I_1-I_2)=0$ (2 marks)

    Applying KVL to mesh 2,
    $-10I_2-10(I_2-I_1)-10(I_2-I_3) = -100$ (2 marks)

    Applying KVL to mesh 3,
    $-10(I_3-I_2)-10(I_3-I_1) = 50$ (2 marks)
    Solving,
    $I_1= 1.25$ A, $I_2=3.75$A, $I_3=0$ (4 marks)

12. Sectional Dia =0.03m N= 1000 I= 2 A diameter of ring = 0.25m l_g = 0.0015 m

$A = \frac{\pi}{4}d^2 = \frac{\pi}{4}(0.03)^2 = 0.0007\ m^2$

Mmf=NI= 1000 x 2 = 2000 AT (2 marks)

AT_i = 0.4 x 2000 = 800 AT

AT_g = 1200 AT

$B_g = B_i = \frac{ATgx\mu}{lg}$ = (1200 x 4 x π x 10^{-7})/0.0015 = 1.0053 T (3 marks)

$\Phi = B_gA$ = 1.0053 x 0.0007 = 0.704 mWb (2 marks)

$l_i = \pi D - l_g = \pi$ x 0.25- 0.0015 = 0.784 m

$\mu_r = B_il_i / \mu_0AT_i$ = [1.0053 x 0.784]/ [4 x π x 10^{-7} x 800} = 783 (3 marks)

13. a) Single turn coil rotated with uniform angular velocity in a uniform magnetic field

Diagram with explanation - 4 marks

generated emf waveform - 1 mark

b) Z=6.87Ω - 1 mark

(i) current =V/Z= 33.48A - 1 mark

(ii) cos ϕ=R/Z = 0.73 - 1 mark

(iii) Power consumed= 5.6kW - 1 mark

(iv) Capacitor value either C=1.39mF or C=446.4μF

(if atleast one of these is found - 1 mark)

14.

(i) Star

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

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

power factor = R/Z= 0.538 - 1 mark

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

(ii) Delta

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

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

power factor = $R/Z= 0.538$ - 1 mark

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

15. Block diagram: 4 marks

Explanation : 6 marks

16. Five marks each

17. a) Derivation – 4 marks

b) In the syllabus, different types of motors are only mentioned. Hence any attempt can be given full mark (6 marks)

18. a) Copper loss, Core loss – 2 marks

b) Expression – 2 marks

c) E2=1500V – 2 marks

Flux=5.63mWb

B=1.13T – 2 marks

Turns ratio = 0.33 – 2 marks

19. a) Explanation (4 marks)

b) How to make it self starting (4 marks)

naming 2 types (2 marks)

20. a) (1) $N_s =120f/p =120*50/4 = 1500$ r.p.m. (2 marks)

2) speed when slip is 4% or .04, $N=N_s (1-s) =1500(1-0.04) = 1440$ r.p.m. (2 marks)

3) slip when motor runs at 600 r.p.m. , $S'=(N_s –N)/N_s =(1500-600)/1500 = 0.6$(2 marks)

Rotor frequency $f' = S'f = 0.6*50 = 30Hz$. (2 marks)

b) naming “squirrel cage” and “slip ring” induction motor (2 marks)

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