

# R1907

## Final 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: BE101-03

Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100

Duration: 3 Hours

### PART A

*Answer all questions, each carries 4 marks*

Marks

- 1 Definition of self-inductance-2 marks  
Derivation-2 marks  
$$L_A = \frac{N\Phi}{I} \text{ Henry} \quad (4)$$
$$L_A = \frac{N^2}{S} \text{ Henry}$$
- 2 KCL-2 marks  
KVL-2marks (4)
- 3 Magnetic circuit – 1+ 1  
Electrical equivalent – 1+ 1 (4)
- 4  $B = \frac{\Phi}{A} = 0.2T$  (4)
- 5 Calculation of f-2 Marks  
Calculation of form factor-2 Marks (4)
- 6 RMS Value-2 marks  
Peak Factor-2marks (4)
- 7 2+2=4 marks (4)
- 8 Active power is the actual power dissipated in the circuit resistance  
 $P = VI \cos\phi$  W (2 marks)  
Reactive power is developed in the inductive or capacitive reactance of the circuit. It is given by  $VI \sin\phi$  (1 mark) (4)  
Apparent power is the product of rms value of applied voltage and current.  
Apparent power =  $VI$  VA (1 mark)
- 9 Minimum 4 points – 1 mark for each point (4)
- 10 power factor of the load - 2 marks  
total power-2 marks (4)

## PART B

Answer any four full questions, each carries 10 marks.

- 11 a .  $S = \frac{l}{\mu A}$ -----2 marks (2)
- b  $S=625 \times 10^6$ -----2 marks  
 $L=1.6 \times 10^{-3}H$ -----2 marks (8)  
Energy stored =0.1152J-----2 marks  
Emf=1.92V----2 marks
- 12 Voltage = 18.64 V  
Node Analysis-5 marks (10)  
Mesh Analysis-5 marks
- 13 Reluctance  $S=1/\mu_0\mu_r a =663,145.6$  (2 marks)  
 $I=S\Phi/N =66.3$  mA (2 marks)  
Ring with air gap  
 $S_g=795,774.71$  (1 mark)  
 $ST=S+S_g$  (1mark) (10)  
 $F=Fa +Fi= (S+S_g) \Phi =H_i l_i + H_g l_g =291.78$  AT (1 mark)  
 $I=F/N=145.89$  mA (1 mark)  
Fraction of AT required = $Fa/F=159.15/291.78= 54.5\%$  (2 marks)
- 14 Mesh Equations-6 marks  
Mesh Currents-3 marks (10)  
Power delivered-1 mark
- 15 RMS Value-5 marks (10)  
Average Value-5 marks
- 16 Total admittance = $0.26+0.06j$  mho. (4 marks)  
 $I= YV=53.36$  A (2marks) (10)  
angle= 12.99 (2 marks)  
t Power factor of the whole circuit =0.974 (lead) (1+1 mark)

## PART C

Answer any one full question from each module, each carries 10 marks.

### Module V

- 17  $f_0 = \frac{1}{2\pi\sqrt{LC}}$   
= $1/6.28\sqrt{20 \times 10^{-3} \times 10 \times 10^{-6}} = 356$  Hz (2 mark)  
 $I_0 = V/R =5A$

$$X_L = 2\pi fL = 44.7\Omega; \quad (10)$$

$$V_L = I_0 X_L = 223.5V \quad (2 \text{ mark})$$

$$V_R = I_0 R = 50V \quad (2 \text{ mark})$$

$$V_C = I_0 X_C = I_0 / 2\pi fC = 223.5V \quad (2 \text{ mark})$$

$$Q = V_L / V = 4.47 \quad (2 \text{ mark})$$

18 When at 50 Hz,  $I_R = 23A$  (1mark)

$$I_L^2 = 25^2 - 23^2, I_L = 9.79A \quad (1\text{mark})$$

$$X_L = 23.493 \text{ Ohm} \quad (2 \text{ marks}),$$

$$L = 0.075 \text{ H} \quad (1\text{mark})$$

At 36 A

$$I_L^2 = 36^2 - 23^2, I_L = 27.7A \quad (1\text{mark})$$

$$X_L = 8.3 \text{ Ohm} \quad (2 \text{ marks}),$$

$$f = 17.61 \text{ Hz} \quad (2 \text{ marks})$$

### Module VI

19 a  $I_R = 23.09 < 0A$ , (1mark)

$$I_Y = 15.4 < -150A, \quad (1\text{mark})$$

$$I_B = 23.09 < 150A \quad (1\text{mark})$$

$$\text{Neutral current} = -10.243 + 3.845j$$

$$= 10.94 < -20.57 \quad - \quad (2 \text{ marks})$$

b Power  $P = 1154 + 557 = 1711W$

$$P = 3 V_p I_p \cos \Phi = 3 V_p \left( \frac{V_p}{Z_p} \right) \cos \Phi \quad (5)$$

$$Z_p = 30 < 31.3 \quad (5 \text{ marks})$$

20 Derivation of  $W_1 + W_2 = \text{total power} - 4\text{marks}$

Derivation of  $W_1 - W_2 = \text{total reactive power} - 4 \text{ marks} \quad (10)$

Derivation of PF = 2 marks

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