



G1103

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# APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

## Scheme for Valuation/Answer Key

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

**SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (S), MAY 2019**

**Course Code: EE409**

**Course Name: Electrical Machine Design**

Max. Marks: 100

Duration: 3 Hours

### PART A

*Answer all questions, each carries 5 marks.*

Marks

- |   |   |     |
|---|---|-----|
| 1 | 5 marks   | (5) |
| 2 | Derivation of reluctance of slotted armature - 2 marks<br>Derivation of reluctance of smooth armature - 2 marks<br>Comparison - 1 marks | (5) |
| 3 | Derivation of $P_a = C_0 D^2 L_n$ - 5 marks   | (5) |
| 4 | 5 types- 1 mark each  | (5) |
| 5 | 5 marks   | (5) |
| 6 | 5 points - 1 mark each  | (5) |
| 7 | 5 marks   | (5) |
| 8 | 5 marks   | (5) |

### PART B

*Answer any two full questions, each carries 10 marks.*

- |    |   |     |
|----|---|-----|
| 9  | a) 4 components 1 mark each                               | (4) |
|    | b) Derivation - 6 marks                                   | (6) |
| 10 | a) 4 marks  | (4) |
|    | b) Net iron area $A_i = 0.0573 \text{ m}^2$ - (0.5 marks) | (6) |
|    | $D = 0.435 \text{ m}$ - (0.5 marks)                       |     |
|    | $W_w = 0.115 \text{ m}$ - (0.5 marks)                     |     |
|    | $A_w = 0.0293 \text{ m}^2$ - (0.5 marks)                  |     |
|    | $H_w = 0.26 \text{ m}$ - (1 marks)                        |     |
|    | $D_y = a = H_y = 0.272 \text{ m}$ - (1 marks)             |     |
|    | $H = 0.804 \text{ m}$ - (1 marks)                         |     |
|    | $W = 0.737 \text{ m}$ - (1 marks)                         |     |
| 11 | a) 5 marks  | (5) |
|    | b) 5 marks  | (5) |

**PART C**

*Answer any two full questions, each carries 10 marks.*

- 12 a) 5 marks (5)  
 b) 5 marks (5)
- 13 Output coefficient  $C_0 = 274$  -2 marks (10)  
 $D^2L = 147 \text{ m}^2$  -2 marks  
 $D = 8.27 \text{ m}$  -3 marks  
 $L = 2.14 \text{ m}$  -3 marks
- OR**
- Output coefficient  $C_0 = 274$  -2 marks  
 $D^2L = 147 \text{ m}^2$  - 2 marks  
 Trying circular poles, taking  $L/\tau = 0.65$ ,  $L = 0.051 D$   
 $D = 14.2 \text{ m}$ ,  $L = 0.7242 \text{ m}$   
 $V_a = 111.5 \text{ m/s}$ . This is above the maximum permissible value of 65 m/s. So circular poles cannot be used and trying for rectangular poles.  
 Take  $L/\tau = 4$  (Gives cheaper design also the rotor peripheral speed is below 65 m/s)  
 $D = 7.75 \text{ m}$  -3 marks  
 and  $L = 2.43 \text{ m}$  -3 marks

- 14 a) 5 marks (5)  
 b)  $C_0 = 214$  -1 mark (5)  
 $D^2L = 3.74 \text{ m}^2$  -1 marks  
 $D = 3.9 \text{ m}$   $L = 0.24 \text{ m}$  -2 marks  
 $V_a = 38.2 \text{ m/s}$   
 Dove tail construction is used -1 mark

**PART D**

*Answer any two full questions, each carries 10 marks.*

- 15 a) 5 marks (5)  
 b) Cogging -2 marks ,crawling -3 marks (5)
- 16 a) 6 marks (6)  
 b) 4 marks (4)
- 17 a)  $C_0 = 147.07$  -1 marks (5)  
 $D^2L = 0.0093 \text{ m}^3$  -1 marks  
 $D = 0.318 \text{ m}$  -1.5 marks  
 $L = 0.091 \text{ m}$  -1.5 marks
- b) 5 marks (5)

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