POLYTECHNIC, B.E/B.TECH, M.E/M.TECH, MBA, MCA & SCHOOL
Notes
Syllabus
Question Papers
Results and Many more…
Available @
www.binils.com

89

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90489

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Sixth Semester

Electrical and Electronics Engineering

EE 8002 – DESIGN OF ELECTRICAL APPARATUS

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Assume missing data wherever necessary.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

www.binils.com

1. List the limitations imposed on the design of electrical machines.
2. Give the expression of computing magnetizing current for concentrated winding.
3. Prove that Volts/turn = $K(S)^{\frac{1}{2}}$
4. Why are distribution transformers designed to have maximum efficiency at load quite lower than the full load?
5. Write the expression for copper in armature winding of a DC machine.
6. Write the methods of finding D^2L of a DC machine.
7. Give the typical values of L/τ to have good efficiency, minimum cost and good overall design of three phase induction motor.
8. Why the length of air gap in induction motor is kept minimum possible whereas in a dc machine it is larger?
9. Mention the reason why higher voltages are possible to be generated in an alternator compared to a dc generator.
10. Give the reasons of the presence of harmonics in the output voltage waveform of a synchronous generator and what means are adopted to minimize them.

Available in /Binils Android App too, *Check www.Photoplex.Net & Android App*

POLYTECHNIC, B.E/B.TECH, M.E/M.TECH, MBA, MCA & SCHOOL
Notes *Available @*
Syllabus
Question Papers www.binils.com
Results and Many more…

PART B — (5 × 13 = 65 marks)

11. (a) Deduce the expressions for the leakage reactance of

(i) semi-enclosed parallel sided slot having single layer winding (6)

(ii) circular slot (7)

Or

(b) Develop the winding table and draw the winding diagram of a 4 pole, 15 slot double layer simplex wave winding for a dc generator. Also show the brush positions. (13)

12. (a) Calculate the kVA output of a single phase transformer from the following data:

height of window/Distance between core centers = 2.8, Dia of circumscribing circle/distance between core centers = 0.56, Net iron area/area of circumscribing circle = 0.7, Current density = 2.3 A/mm^2, window space factor = 0.27, frequency = 50 Hz and flux density in core = 1.2 Wb/m^2. (13)

Or

www.binils.com

(b) Determine the main dimensions of the core for a 250kVA, 6.6kV/415V, 50Hz. 3 phase section of the windings. (13)

Assume the following: Approximate volts/turn = 9, B_{max}= 1.25 Wb/m^2, A_i = 0.62d^2, window space factor = 0.27, Height of window = 2W_w, current density = 250A/cm^2 and width of lamination = 0.92d

13. (a) (i) Derive the output equation of DC machines. (6)

(ii) List the pros and cons of having more number of poles. List the guidelines for selecting the number of poles. (7)

Or

(b) Design a commutator giving details of brushes having regard to commutation and temperature rise for a 1000kW, 500V, 10 pole, 270 rpm DC machine. The armature diameter 160cm has 450 coils.

Assume the following: Commutator dia 0.62 of armature dia, Commutator peripheral speed 16m/sec, Commutator pitch 4mm, Brush current 65A, Current density in brushes 7A/cm^2, Brush drop = 2V, Brush pressure = 1250 kg/m^2 and Temperature rise 40°C. (13)

Available in /Binils Android App too, *Check www.Photoplex.Net & Android App*

POLYTECHNIC, B.E/B.TECH, M.E/M.TECH, MBA, MCA & SCHOOL
Notes
Syllabus
Question Papers
Results and Many more…
Available @
www.binils.com

91

14. (a) (i) Derive the output equation of three phase induction motor. (6)

(ii) Discuss the factors affecting the choice of specific electric and magnetic loadings. (7)

Or

(b) Discuss the circle diagram as obtained from the design parameters and its use to obtain the performance characteristics of a 3 phase induction motor. (13)

15. (a) What is meant by SCR of an alternator? Discuss its significance in relation to stability, voltage regulation and practical operation of synchronous generators. (13)

Or

(b) (i) Determine suitable values of diameter of air gap, core length and peripheral speed for a 2.5MVA 3.3kV, 32 pole, 50Hz vertical shaft water wheel generator using the following data:

Specific magnetic loading = 0.68Wb/m², specific electric loading = 30000ac/m, ratio of pole arc to pole pitch for the circular poles = 0.65. (10)

(ii) If the runaway speed is to be limited to twice the normal speed, suggest type of pole construction. (3)

www.binils.com

PART C — (1 × 15 = 15 marks)

16. (a) Discuss in detail the step by step design procedure adopted for shunt winding field system of a D.C machine. (15)

Or

(b) In two synchronous machines running at the same speed and having the same number of poles, the physical dimensions are in the ratio 3:2. Compare the outputs, armature copper losses and iron losses in the two machines. Assume specific magnetic loading and current density to be same for both the machines. (15)

Available in /Binils Android App too, *Check www.Photoplex.Net & Android App*