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Code No. : 18321 M

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD*Accredited by NAAC with A++ Grade***B.E. (E.E.E.) VIII-Semester Make-up Examinations, August-2022****Electrical Machine Design (PE-V)**

Time: 3 hours

Max. Marks: 60

*Note: Answer all questions from Part-A and any FIVE from Part-B***Part-A (10 × 2 = 20 Marks)**

Q. No.	Stem of the question	M	L	CO	PO
1.	Define stacking factor, what would be the value of stacking factor for solid core and laminated core.	2	1	1	1,2,3,4
2.	Brief how to fix the rating of electrical machines for variable loads.	2	2	1	1,2,3,4
3.	Compare dynamo grade steel and transformer grade steel.	2	3	2	1,2,3,4
4.	Mention the dimensions of each step for 2 – stepped core transformer with help of pictorial view.	2	1	2	1,2,3,4
5.	Give the basic guide lines for selection of stator slots for 3 phase induction motor.	2	1	3	1,2,3,4
6.	How friction and windage losses varies with respect to output of 3 phase induction motor.	2	1	3	1,2,3,4
7.	Define Short Circuit Ratio of a 3 phase alternator.	2	2	4	1,2,3,4
8.	Write down the main consideration in the selection of specific loadings for the design of an 3 phase synchronous machine.	2	1	4	1,2,3,4
9.	Mention the advantages of digital computers to design the electrical machines.	2	2	5	1,2,3,4
10.	Draw the flow chart for analysis method.	2	1	5	1,2,3,4
Part-B (5×8 = 40 Marks)					
11. a)	Define the following terms (i) Primary Coolant (ii) Secondary Coolant (iii) Natural Cooling (iv) Self Cooling.	4	1	1	1,2,3,4
b)	Determine the maximum temperature rise for a 100 amps shunts consists of 4 strips of nickel-alloy connected in parallel each having a cross-section of 20 x 1.5 mm ² . The normal voltage drop is 20 mV. The alloy used has the following data : resistivity = 44 X 10 ⁻⁸ Ω-m, specific heat 300 J/kg °C. specific gravity = 1000 kg/m ³ , rate of heat dissipation = 100 W/m ² °C. Evaluate the time taken to reach 90 percent of maximum value.	4	3	1	1,2,3,4
12. a)	Derive the output equation of 3 – phase transformer from basis.	4	2	2	1,2,3,4
b)	A 3 phase delta-star core type transformer rated at 100KVA, 6600/440 V, 50 Hz. A suitable core with 3 steps having a circumscribing circle of 0.3 m diameter and leg spacing of 0.5 m is available. EMF / turn = 10 V, δ= 2.3 A /mm ² , k _w = 0.25 and S _f = 0.9 (stacking factor) Estimate the main dimensions including winding conductor area	4	4	2	1,2,3,4

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13. a)	Explain the design of end rings for an 3 phase induction motor.	4	2	3	1,2,3,4
b)	Determine the main dimensions, number of stator slots and number of turns per phase of a 5 kW, 400 V, 3 phase, 4 pole, 50 Hz squirrel cage induction motor to be started by star delta starter. Average flux density = 0.28 wb/m ² , ampere conductors per metre = 20000, efficiency = 90 %, p.f. = 0.8,	4	3	3	1,2,3,4
14. a)	Explain the design of field winding for an 3 phase alternator.	4	2	4	1,2,3,4
b)	A 500 MVA, 22kV, 50 Hz, 2 pole, 3 phase star connected alternator has a stator bore of 1.2 m and stator core length of 6.5 m, the stator winding has 2 conductors per slot and two circuits per phase. The specific electric loading is 90000 ampere conductors per metre, winding factor is 0.96. Calculate number of stator slots and average flux density.	4	4	4	1,2,3,4
15. a)	Explain the synthesis method of computer aided design of electrical machine with help of flowchart.	4	2	5	1,2,3,4
b)	Explain the working principle of BLDC motor.	4	2	5	1,2,3,4
16. a)	An Induction motor has to perform the following duty cycle. 75 kW for 10 Minutes, No load for 5 Minutes, 45 kW for 8 Minutes, No load for 4 min. Which ism repeated indefinitely. Determine a suitable capacity of continuous rated motor to perform the aforesaid duty. Motor of standard ratings 45,55, 75 kW are available. The ratio of maximum torque to nominal torque should be less than 1.8.	4	3	1	1,2,3,4
b)	A 1000 kVA, 6600/440 V, 50Hz, 3 phase, delta/star, core type, oil immersed natural cooled transformer. The design data of the transformer is: Distance between centres of adjacent limbs = 0.47 m, outer diameter of high voltage winding = 0.44 m, height of frame = 1.24 m. Core loss = 3.7 KW and I ² R loss = 10.5 KW. Design a suitable tank for the transformer. The average temperature rise of oil should not exceed 35°C. The specific heat dissipation from the tank walls is 6 W/m ² — °C and 6.5 W/m ² — °C due to radiation and convection respectively. Assume that the convection is improved by 35% due to convection	4	4	2	1,2,3,4
17.	Answer any <i>two</i> of the following:				
a)	Explain, What are the factor to be considered to estimate the air gap length of a 3 phase induction motor.	4	2	3	1,2,3,4
b)	What are the advantages and disadvantages of designing the alternators with higher gap flux density?	4	2	4	1,2,3,4
c)	Explain the general procedure for optimization of electrical machines.	4	2	5	1,2,3,4

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	21%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	39%

VIII th Sem All