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B.Tech. Degree III Semester Regular/Supplementary Examination in Marine Engineering November 2022

19-208-0302 ELECTRICAL TECHNOLOGY (2019 Scheme)

Time: 3 Hours

Maximum Marks: 60

Course Outcome

On successful completion of the course, the students will be able to:

- CO1: Understand the construction and working of transformers, transformer losses, current transformers, and potential transformers.
- CO2: Study the different types, constructional details, operational principles, and performance characteristics of DC motors and DC generators.
- CO3: Understand the constructional details, operational principles, and performance characteristics of induction motors and alternators.
- CO4: Learn about the constructional details, operational principles, and performance characteristics of Alternators.
- CO5: Understand the constructional details, operational principles, and performance characteristics of synchronous machines.

Bloom's Taxonomy Levels (BL): L1 – Remember, L2 – Understand, L3 – Apply, L4 –Analyze,

L5 – Evaluate, L6 – Create

PO – Programme Outcome

		(5 × 15 = 75)	Marks	BL	CO	PO
I.	(a) Draw and explain the phasor diagram of a transformer for K = 1, at UPF.		5	L1	1	2.4.1
	(b) Which type of load causes a lagging power factor? Draw the phasor diagram of the transformer at the lagging power factor.		10	L2	1	2.4.2
OR						
II.	A 30 kVA, 2400/120-V, 50 Hz transformer has a high voltage winding resistance of 0.1 Ω and a leakage reactance of 0.22 Ω. The low voltage winding resistance is 0.035Ω and the leakage reactance is 0.012 Ω. Find the equivalent winding resistance, reactance and impedance referred to the: (i) High voltage side (ii) The low-voltage side.		15	L4	1	4.3.4
III.	Explain the constructional details of a DC machine. Derive the EMF equation of a DC generator.		15	L2	2	1.2.1
OR						
IV.	A short-shunt DC compound generator supplies 200 A at 100 V. The resistance of armature, series, and shunt field windings are 0.04, 0.03, and 60 ohms respectively. Find the emf generated. Also, find the emf generated if the same machine is connected as a long-shunt machine.		15	L4	2	4.3.4
V.	Explain the Double revolving field theory of Single phase Induction motor. With a neat circuit diagram, explain the load test on a single phase induction motor to determine the efficiency of the motor.		15	L2	3	1.2.2

OR**(P.T.O.)**

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		Marks	BL	CO	PO
VI.	A 440-V, 3- ϕ , 50 Hz, 4-pole, Y-connected induction motor has a full-load speed of 1425 rpm. The rotor has an impedance of $(0.4+j4) \Omega$ and a rotor/stator turn ratio of 0.8. Calculate: (i) Full load torque (ii) Rotor current and full-load rotor Cu loss (iii) Power output if windage and friction losses amount to 500 W (iv) Maximum torque and the speed at which it occurs (v) Starting current (vi) Starting torque.	15	L4	3	4.3.4
VII.	Explain the constructional details of an alternator. Derive the generated EMF equation of the alternator.	15	L1	4	1.2.1
OR					
VIII.	From the following test results, determine the voltage regulation of a 2000-V, 1- ϕ alternator delivering a current of 100 A at (i) Unity p.f. (ii) 0.8 leading p.f. (iii) 0.71 lagging p.f. Test results: Full-load current of 100 A is produced on short-circuit by a field excitation of 2.5 A. An e.m.f. of 500 V is produced on an open circuit by the same excitation. The armature resistance is 0.8Ω .	15	L5	4	4.3.3
IX.	A 3- ϕ , 440-V, 50 Hz star-connected synchronous motor takes 7.46 kW from the three-phase mains. The resistance per phase of the armature winding is 0.5Ω . The motor operates at a p.f. of 0.75 lag. Iron and mechanical losses amount to 500 W. The excitation loss is 650 W. Assume the excitation source is a separate one. Calculate: (i) Armature current (ii) Power supplied to the motor (iii) Efficiency of the motor.	15	L3	5	2.3.2
OR					
X.	What are the applications of Synchronous motors? Compare Synchronous with Induction motors.	15	L1	5	1.2.1

Bloom's Taxonomy Levels

L1-13.33%, L2-26.66%, L3-10%, L4-20%, L5-30%
