

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 121405

Roll No.

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B.Tech.

(SEM. IV) THEORY EXAMINATION 2013-14

ELECTRO-MECHANICAL ENERGY CONVERSION-I

Time : 3 Hours

Total Marks : 100

- Note :**
- (1) Attempt **all** questions.
 - (2) Each question carries equal marks.

1. Answer any **two** parts of the following : **(10×2=20)**
 - (a) Discuss the principle of "electro mechanical energy conversion". Also explain its applications and limitations.
 - (b) Explain the following terms in conjunction with electric machines :
 - (i) Winding Factor (K_w)
 - (ii) Pitch Factor (K_p)
 - (iii) Distribution Factor (K_d)Also mention its physical meanings & relevant expressions.
 - (c) Explain the following :
 - (i) Faraday's law of electromagnetic induction.
 - (ii) Lenz's law
 - (iii) Fleming's right & left hand rules.Also mention the significances of above laws and rules in electric machines.

2. Answer any **two** parts of the following : **(10×2=20)**
- Discuss the constructional details and working principle of 2-pole and 4-pole D.C. machines with interpole and compensating windings. Also mention the types of d.c. machines and its applications in industry.
 - What is "armature reaction" in D.C. machines ? What are the effects of armature reaction ? How the armature reaction is minimized ? Explain with the help of suitable diagrams.
 - A 4-pole D.C. shunt generator with lap connected armature has field and armature resistance of 50Ω and 0.1Ω respectively. It supplies power to sixty numbers of 100 V, 40 W lamps. Calculate the armature current and the generated emf. Allow a contact drop of 1V/Brush and interpole and compensating winding drops are 0.5 V/pole and 0.25 V/pole respectively.
3. Answer any **two** parts of the following : **(10×2=20)**
- Explain what happens, giving reasons thereof in the following cases :
 - A D.C. series motor is started at no-load.
 - The field winding of a D.C. shunt motor gets disconnected while in normal operation.
 - In a D.C. shunt motor field terminals are reversed.
 - A 12-pole dc generator has a simplex wave wound armature having 144 coils of 10 turns each. The resistance of each turn is 0.011Ω , the flux per pole is 0.05 wb and speed is 200 RPM.
 - What is the induced emf ?
 - What is the armature resistance ?
 - What is the induced counter torque on the shaft of the machine, if a 1000Ω resistance is connected to its terminals ? Neglect the effect of armature resistance

- Explain the following :
 - Brake test
 - Swinburne's test
 - Hopkinson test
 Also mention their importances.

4. Answer any **two** parts of the following : **(10×2=20)**
- Discuss the constructional details of CORE and SHELL type 1- ϕ transformers. Explain the phasor diagram of 1- ϕ transformer at the following loads :
 - Unity p.f. load
 - Lagging p.f. load
 - Leading p.f. load
 - What do you mean by " 1- ϕ AUTO-TRANSFORMER" and "3- ϕ AUTO-TRANSFORMER" ? Also mention its advantages and limitations over 1- ϕ , 2-winding transformers.
 - A 20 KVA, 250/2500 V, 50 Hz, 1- ϕ , transformer gave the following test results :

O.C (L.V.Side)	250V	1.4A	105W
S.C. (H.V. Side)	120V	8A	320W

Find the parameters and draw the equivalent circuit of 1- ϕ transformer as referred to :

- Low voltage side
 - High voltage side.
5. Answer any **two** parts of the following : **(10×2=20)**
- Explain the following :
 - Phasor groups in 3- ϕ transformers

- (ii) Excitation phenomena in 3- ϕ transformers
 - (iii) Harmonics in 3- ϕ transformers.
- (b) What do you mean by "load sharing" in 3- ϕ transformers? Also mention its basic role and limitations in 3- ϕ transformers.
- (c) Discuss the unbalanced operation of 3- ϕ transformers. Also mention its advantages and disadvantages.