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**GIET UNIVERSITY, GUNUPUR – 765022**  
 B. Tech (Third Semester) Supplementary Examinations, December – 2022  
**BEEES3040 – Electrical Machines & Power Utilisation**  
 (AGE)

Time: 3 hrs

Maximum: 70 Marks

**Answer ALL Questions**

**The figures in the right hand margin indicate marks.**

**PART – A: (Multiple Choice Questions)**

**(1 x 10 =10 Marks)**

Q.1. Answer ALL questions

- |   | [CO#] | [PO#] |
|---|-------|-------|
| a. No-load test on a transformer is carried out to determine  | CO2   | PO1   |
| (i) copper loss   |       |       |
| (ii) magnetising current  |       |       |
| (iii) magnetising current and no-load loss  |       |       |
| (iv) Efficiency of the transformer  |       |       |
| b. Which of the following is the unit of magnetic flux density?   | CO1   | PO1   |
| (i) Weber   |       |       |
| (ii) Lumens   |       |       |
| (iii) Tesla   |       |       |
| (iv) None of these  |       |       |
| c. In a d.c. generator, the generated e.m.f. is directly proportional to the  | CO3   | PO1   |
| (i) field current   |       |       |
| (ii) pole flux  |       |       |
| (iii) number of armature parallel paths   |       |       |
| (iv) number of dummy coils  |       |       |
| d. A step-down transformer increases  | CO2   | PO1   |
| (i) voltage   |       |       |
| (ii) current  |       |       |
| (iii) Power   |       |       |
| (iv) Frequency.   |       |       |
| e. Tesla is a unit of ____  | CO1   | PO1   |
| (i) field strength  |       |       |
| (ii) inductance   |       |       |
| (iii) flux density  |       |       |
| (iv) flux   |       |       |
| f. If 's' is the slip and 'f' is the supply frequency, the frequency of rotor current is given by                   | CO4   | PO2   |
| (i) s.f   |       |       |
| (ii) s <sup>2</sup> f   |       |       |
| (iii) f/s   |       |       |
| (iv) sf/2   |       |       |
| g. The back e.m.f. of a d.c. motor  | CO3   | PO1   |
| (i) often exceeds the supply voltage  |       |       |
| (ii) aids the applied voltage   |       |       |
| (iii) helps in energy conversion  |       |       |
| (iv) regulates its armature voltage   |       |       |
| h. According to Faraday's laws of electromagnetic induction, an emf is induced in a conductor whenever?             | CO1   | PO1   |
| (i) The conductor is perpendicular to the magnetic field  |       |       |
| (ii) Lies in the magnetic field   |       |       |
| (iii) Cuts magnetic lines of flux   |       |       |
| (iv) Moves parallel to the magnetic field   |       |       |
| i. The load current and field current of a DC shunt generator are 80A and 5A respectively. It's armature current is | CO3   | PO1   |
| (i) 85A   |       |       |
| (ii) 80A  |       |       |
| (iii) 75A   |       |       |
| (iv) 400A   |       |       |
| j. Transformers are rated in KVA instead of KW because  | CO2   | PO1   |
| (i) load power factor is often not known  |       |       |
| (ii) KVA is fixed whereas kW depends on load p.f  |       |       |
| (iii) total transformer loss depends on   |       |       |
| (iv) ) it has become customary  |       |       |
| voltage-ampere  |       |       |

**PART – B: (Short Answer Questions)****(2 x 10 = 20 Marks)**Q.2. Answer ALL questions

	[CO#]	[PO#]
a. Name the two windings of a single-phase induction motor	CO4	PO1
b. A transformer reduces voltage from 120 volts in the primary to 6 volts in the secondary. Find the voltage ratio.	CO2	PO1
c. What are the properties of ideal transformer?	CO2	PO1
d. What is meant by armature reaction?	CO3	PO1
e. What is Hysteresis loss?	CO1	PO1
f. Mention the factors on which hysteresis loss depends?	CO2	PO1
g. Express reluctance in terms of MMF.	CO1	PO1
h. What are the advantages of cage motor?	CO4	PO1
i. Define efficiency of the transformer?	CO2	PO1
j. State Faraday's law of Electromagnetic Induction.	CO1	PO1

**PART – C: (Long Answer Questions)****(10 x 4 = 40 Marks)**Answer ALL questions

	Marks	[CO#]	[PO#]
3. a. Explain the construction of single phase transformer.	5	CO2	PO1
b. In a 25KVA, 2000/200V, single phase transformer, the iron loss and full load cu losses are 350W & 400W respectively. Calculate the efficiency at unity p.f on (i) full load (ii) half full load.	5	CO2	PO2
(OR)			
c. A shunt generator delivers 450 A at 230 V and the resistance of the shunt field and armature are 50 $\Omega$ and 0.03 $\Omega$ respectively. Calculate the generated e.m.f?	5	CO3	PO2
d. From fundamentals, derive the EMF equation of a DC generator	5	CO3	PO2
4. a. Explain the constructional details of DC generator	5	CO3	PO1
b. A four-pole generator, having wave-wound armature winding has 61 slots, each slot containing 30 conductors. What will be the voltage generated in the machine when driven at 1500 rpm assuming the flux per pole to be 8.0 mWb?	5	CO3	PO2
(OR)			
c. Explain the different speed control methods of squirrel cage induction motor.	5	CO4	PO1
d. Explain 3-point starter with neat diagram.	5	CO3	PO1
5. a. Derive the expression for mmf, reluctance and flux for parallel magnetic circuit with air gap.	5	CO1	PO1
b. An Iron ring of circular cross sectional area of 400 mm <sup>2</sup> and mean diameter of 20cm is wound with 500 turns. If the value of relative permeability is 250, find total flux set-up in the ring. If coil resistance is 474ohm & supply voltage is 240V.	5	CO2	PO2
(OR)			
c. Explain any two types of single phase induction motors.	5	CO4	PO1
d. Derive the expression for mmf, reluctance and flux for series magnetic circuit. Also draw its electrical equivalent circuit.	5	CO1	PO1
6. a. Derive EMF equation of a transformer.	5	CO2	PO1
b. A 2000/200 V, 20 KVA transformer has 66 turns in the secondary. Calculate the primary turns and secondary full load currents, neglecting losses.	5	CO2	PO2
(OR)			
c. Explain how a rotating magnetic field is produced in a three-phase induction motor	5	CO4	PO1
d. Describe the types of losses that occur in a transformer.	5	CO2	PO1

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