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

Question Paper Code: 53323

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Third Semester

Mechanical Engineering

15UEE323 - ELECTRICAL MACHINES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. Which of the following law/rule can he used to determine the direction of rotation of D.C. motor? CO1- R

(a) Lenz's law (b) Faraday's law

(c) Coloumb's law (d) Fleming's left-hand rule

2. Which motor should not be used for centrifugal pumps? CO1- R

(a) Shunt (b) Series

(c) Cumulatively compounded (d) Differentially compounded

3. The basic function of a transformer is to change CO2 -R

(a) the level of the voltage (b) the power level

(c) the power factor (d) the frequency

4. A transformer can have zero regulation at_____. CO2- R

(a) zero p.f. (b) unity p.f. (c) lagging p.f. (d) leading p.f

5. In a 3-phase induction motor, slip for maximum torque in terms of rotor resistance R_2 is CO3 -R

(a) Independent of R_2 (b) Inversely proportional to R_2

(c) Proportional to R_2 (d) Directly proportional to R_2

6. Under which of the following starting methods, an induction motor draws largest starting current? CO3- R

(a) Star-Delta starter (b) Auto-transformer starter

(c) DOL Starter (d) Reduced voltage starting

7. The frequency of EMF generated by an alternator depends upon the alternator speed (N in RPM) and number of poles on the alternator field P and is given as CO4- R

(a) PN/60 (b) 60N/P (c) PN/120 (d) 120N/P

8. A 3-phase synchronous motor has CO4- R

(a) High starting torque (b) No starting torque

(c) Low starting current (d) Low starting torque

9. The type of single-phase induction motor having the highest power factor at full-load is CO5 -R

(a) Shaded pole type (b) Split-phase type

(c) Capacitor-start type (d)Capacitor-run type

10. Universal motors are used on_____. CO5- R

(a) both AC and DC (b) AC only (c) DC only (d) none of these

PART – B (5 x 2= 10Marks)

11. What is the purpose of yoke in DC machine? CO1- R

12. Will the voltage regulation of a transformer based on its primary referred equivalent circuit be the same as that when the equivalent circuit is referred to the secondary? CO2- R

13. The starting torque of a squirrel cage induction motor cannot be altered, when the applied voltage is constant. Why? CO3- R

14. What are the types of rotors used in alternators? CO4- R

15. How can the direction of rotation of a Universal motor be reversed? CO5- R

PART – C (5 x 16= 80Marks)

16. (a) Explain in detail about the construction of DC generator with a neat sketch. CO1 -U (16)

Or

(b) (i) A DC shunt generator is developing rated terminal voltage at some speed. For this generator, answer the following and give a brief explanation in support of your answers. CO1- U (4)

(a) If only the direction of rotation is reversed, will the generator build up?

(b) If the direction of rotation and also the residual magnetism are reversed, will the generator build up?

(ii) Explain in detail the mechanical and electrical characteristics of DC shunt motor, DC series motor and DC compound motor with necessary circuit diagram and equation. CO1 -U (12)

17. (a) (i) Derive the expression for induced emf in a transformer in terms of frequency, the maximum value of flux and the number of turns on the windings. CO2 -U (6)

(ii) Draw the connection diagrams for the open-circuit and short-circuit tests of a single phase transformer, showing all the necessary instruments. Describe briefly how you would perform the above tests. CO2- U (10)

Or

(b) A 20KVA, 2000/200V, 50 Hz transformer is operated at no load on rated voltage,the input being 150W at 0.12 p.f. When its operated at rated load, the voltage drops in the total leakage reactance and the total resistance are , respectively , 2 % and 1% the rated voltage. Determine the input power and power factor when the transformers delivers 10KW at 200V at 0.8 p.f lagging to a load on the LV side. CO2- App (16)

18. (a) (i) Explain with neat sketches the principle of operation of 3-phase induction motor. Describe exactly how rotation is produced. CO3- Ana (8)

(ii) Draw and explain the torque-slip characteristics of 3-phase induction motor. Mark the starting torque and maximum torque on the diagram so drawn. How do starting torque and maximum torque vary with the rotor resistance? CO3 -Ana (8)

Or

	(b)	(i) State various methods of starting of a 3-phase induction motor. Explain with the help of diagram the working of an automatic DOL starter.	CO3 -Ana	(10)
		(ii) Derive the condition for maximum torque of a 3-phase induction motor under running condition.	CO3 -Ana	(6)
19.	(a)	Explain the working principle of 3-phase alternator and derive the e.m.f. equation of an alternator.	CO4- U	(16)
		Or		
	(b)	Explain in detail about the starting methods of Synchronous motors.	CO4 -Ana	(16)
20.	(a)	Explain with neat suitable diagrams the working principle of split-phase and capacitor-start capacitor run induction motor.	CO5- U	(16)
		Or		
	(b)	Describe the constructional features of 'Variable-reluctance' type and 'permanent magnet' type stepper motors. Compare them. Explain the working principle of any one with neat diagram. Also mention few applications of stepper motor.	CO5 -U	(16)