

AMIETE – ET (Current Scheme)

Time: 3 Hours

DECEMBER 2015

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. In a 6-pole d.c. machine, 90 mechanical degrees corresponds to _____ electrical degree.
(A) 30 (B) 180
(C) 45 (D) 270
- b. The d.c. series motor is always started on load, because
(A) At no load, its speed is very high.
(B) It fails to start without load
(C) It cannot develop high starting torque.
(D) All are true.
- c. In a power transformer, iron losses remain practically constant from no load to full load because
(A) Core flux remain constant (B) Leakage flux remain constant
(C) Volume of core constant (D) All are true.
- d. The maximum efficiency of a 100 kVA transformer having iron loss of 900 kW and full load Cu loss of 1600 kW occurs at _____ kVA.
(A) 56.25 (B) 133.3
(C) 75 (D) 177.7
- e. The slip of an induction motor is the ratio of:
(A) Rotor Copper loss/Rotor input (B) Stator Copper loss/Stator input
(C) Rotor Copper loss/Rotor output (D) Rotor Copper loss/Stator input
- f. In synchronous motor, the rotor copper losses are met by
(A) Motor input (B) Armature input
(C) Supply line (D) D.C. source

- g. If a current of 5A flowing in a coil of inductance 0.1H is reversed in 10 msec, e.m.f induced in it is _____ volt.
 (A) 100 (B) 50
 (C) 1 (D) 1000
- h. Pelton turbine are mostly used in hydro-power station are
 (A) Horizontal (B) Vertical
 (C) Inclined (D) None of these
- i. Reciprocal of permeability is
 (A) Reluctivity (B) Susceptibility
 (C) Permittivity (D) conductance
- j. Which d.c. motor will be preferred for machine tools?
 (A) Series (B) Compound
 (C) Shunt (D) None of these

**Answer any FIVE Questions out of EIGHT Questions.
 Each question carries 16 marks.**

- Q.2** a. Define self inductance and Mutual inductance in magnetic circuit. If self inductance of two coils are L_1 and L_2 and mutual inductance is M , then derive the expression for equivalent inductance when flux are additive and subtractive. (8)
- b. A ring has a diameter of 21 cm and a cross-sectional area of 10 cm^2 . The ring is made up of two semicircular sections of cast iron and cast steel, with each joint having reluctance equal to an air-gap of 0.2 mm. Find the ampere-turns required to produce a flux of $8 \times 10^{-4} \text{ wb}$. The relative permeabilities of cast steel and cast iron are 800 and 166 respectively. Neglect fringing and leakage effect. (8)
- Q.3** a. Explain the working principle and operation of single-phase transformer supplying rated load (lagging) with the help of suitable phasor diagrams considering all non-idealities of transformer such as primary & secondary resistances and leakage reactances. (8)
- b. The following readings were obtained from open and short circuit test performed on 10 KVA, 400/100V, 50Hz single phase transformer:
 O.C test: 100 V, 4A, 80 W -on L.V side
 S.C test : 10V, 20A, 120 W -on H.V. side
 Find out equivalent circuit parameters referred to primary. (8)
- Q.4** a. What do you mean by armature reaction? Explain its effect on dc generator and motor. (8)

- b. A 230V shunt motor takes 5 A at no load. The resistance of the armature and field circuit is 0.25 ohm and 115 ohm respectively. If motor is loaded so as to carry 40 A. Determine (1) Iron and Frictional losses (2) Efficiency at given load. (8)
- Q.5** a. Explain torque/ slip characteristics of three phase induction motor under starting and full load conditions. What is the effect of rotor resistance on the shape of characteristics? (8)
- b. A 3-phase, 400V, star connected induction motor has a star connected rotor with stator to rotor turn ratio of 6.5. The rotor resistance and standstill reactance per phase are 0.05 ohm and 0.25 ohm respectively. What should be the value of external resistance per phase to be inserted in the rotor circuit to obtain maximum torque at starting and what will be rotor starting current with this resistance? (8)
- Q.6** a. What is the effect of short pitch winding on induced e.m.f on alternator? What do you mean by pitch factor and distribution factor? (8)
- b. A 3-phase, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 wb sinusoidally distributed and the speed is 375 r.p.m. Find frequency of induced e.m.f and the value of phase & line e.m.f. Assume full pitched coil. (8)
- Q.7** a. Explain the construction and working of Universal motor. Explain the consequences of ac excitation of dc armature. (8)
- b. Why the single phase induction motor is not self-started? What are the means to make it self-started? (8)
- Q.8** a. What are the atmospheric pollutants emitted by coal based thermal power plant? What are effects of them on environment? (8)
- b. How can we generate electricity with the help of Hydro power plant? Explain with it's schematic diagram. What are the merits and de-merits of it over other methods of power generation. (8)
- Q.9** a. What are the applications of fuel cell? Which is different type of fuel cell used in power system? Explain them. (8)
- b. Explain High voltage DC transmission. Draw the block diagram representing main components of HVDC transmission. Also explain the advantages and disadvantages of HVDC transmission. (8)