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S.E. (Mech. Sand/Prod./Indus.) (Second Semester) EXAMINATION, 2010

ELECTRICAL TECHNOLOGY

(2008 COURSE)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) Answer any *three* questions from each Section.

(ii) Answer to the two Sections should be written in separate answer-books.

(iii) Neat diagrams must be drawn whenever necessary.

(iv) Figures to the right indicate full marks.

(v) Use of electronic pocket calculator is allowed.

(vi) Assume suitable data, if necessary.

SECTION I

1. (a) State and explain various factors affecting for good lighting scheme. [5]
- (b) Explain in brief constituents of HT/LV electricity bill. [5]
- (c) Draw only the connection diagram how CT and PT are used for measurement of energy of single phase load. [4]

P.T.O.

- (d) Three identical impedances each of $14 \angle 45.578^\circ \text{ W}$ are connected in delta across a 400 V, 3-phase, 50 Hz A.C. supply. If power supplied to the load is measured by two wattmeter method, find the two wattmeter readings. [4]

Or

2. (a) Write a short note on 'Existing 1-phase and 3-phase tariff'. [5]
- (b) Two wattmeter method is used for the measurement of power in a three-phase balance circuit, supplied from 415 V, three-phase, 50 Hz supply. Calculate : [5]

(i) Total power

(ii) Power factor

(iii) Line current

if both wattmeter readings are 8.5 kW each.

- (c) Define the following terms in connection with illumination : [4]

(i) Plane angle

(ii) Solid angle

(iii) Luminous flux

(iv) Illumination.

(d) State and explain any *four* specifications of three-phase energymeter. [4]

3. (a) Derive condition for maximum efficiency in a transformer. Also derive the expression for kVA supplied at maximum efficiency. [8]

(b) Full load power input to 4-pole, 50 Hz, three-phase induction motor is 50 kW while running at 1440 r.p.m. If stator losses are 1000 watt and frictional losses are 800 watt, determine : [8]

(i) synchronous speed

(ii) % slip

(iii) rotor losses

(iv) rotor power output

(v) % efficiency at full load.

Or

4. (a) With simple diagram explain construction, working, advantages, disadvantages and applications of three-phase induction motor : [8]

(i) Squirrel cage

(ii) Wound rotor/slip ring.

- (b) With the help of single line diagram explain distribution transformer substation. (Answer should contain explanation of various equipments, protections, instruments etc. used in the system) [8]
5. (a) State the various types of single-phase motors used in day-to-day practice. Explain construction, working and applications of any *one* motor with diagram. [8]
- (b) Derive from first principle, the e.m.f. generated per phase of synchronous generator. [5]
- (c) A three-phase, 4-pole, 50 Hz alternator has total 96 slots and 12 conductors per slot. If flux per pole is 50 mWb, coil span factor is 0.9914 and distribution factor is 0.9576, determine e.m.f. generated per phase. [3]

Or

6. (a) A 100 kVA, 865 V, 50 Hz, three-phase star connected alternator has an armature resistance and synchronous reactance of 0.2 W and 4 W respectively per phase. Find the regulation when the alternator its rated output at : [8]
- (i) 0.8 lagging power factor
- (ii) 0.8 leading power factor.

- (b) With neat construction diagram explain construction, working, application and features of shaded pole motor. [5]
- (c) List the specifications of synchronous generator used in practice. [3]

SECTION II

7. (a) Derive the e.m.f. equation of a d.c. generator from first principle. [6]
- (b) With the help of suitable diagram, explain any *one* type of stepper motor. Also state its applications. [6]
- (c) A 8-pole d.c. motor takes 80 A armature current from supply. If flux per pole of the motor is 50 mWb and armature has total 720 conductors lap wound, calculate the gross torque developed by the motor armature. [6]

Or

8. (a) State the comparison between a.c. and d.c. servomotor. [6]
- (b) A 250 V, d.c. shunt motor has armature resistance $0.15 \ \Omega$ and field winding resistance of $125 \ \Omega$. At full load motor draw 50 A current from the supply and runs at 1500 r.p.m. Determine the speed of the motor when motor draws 15 A current from the supply. [6]

- (c) Explain with diagram any *two* methods of speed control of d.c. series motor. [6]
9. (a) Draw and explain V-I characteristic of SCR. Mark all salient points on it. [8]
- (b) Explain construction, working, output characteristic, transfer characteristic of enhancement type *n*-channel MOSFET. [8]

Or

10. (a) Explain merits, demerits and applications of IGBT. Also explain its V-I characteristic. [8]
- (b) State in detail comparison between SCR and MOSFET (at least 8 points). [8]
11. (a) State and explain various advantages offered by electrical drives. [6]
- (b) Explain with the help of neat diagram and V-I characteristic two quadrant chopper circuit. [6]
- (c) Write a short note on V/F control of three-phase induction motor. [4]

Or

12. (a) State advantages, disadvantages and applications of group drives system used in industry. [6]

- (b) Explain with suitable diagram, how frequency control of three-phase induction motor is obtained by solid state controlled devices. [6]
- (c) Suggest the motor suitable for the following application with reason : [4]
- (i) Electrical traction
 - (ii) Lathe machine.

