ROLL NO. _____

Code: DE71 **Subject: POWER ELECT**

DipIETE – ET (NEW SCHEME)

Time: 3 Hours **JUNE 2012** **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. Power Electronics equipment has very high efficiency, because_____

(A) the device always operate in active region.
(B) the device never operate in active region.
(C) the device transverse active region at high speed and stay at the two states, ON and OFF.
(D) cooling is very efficient.

b. In the conduction mechanism of schottky diode_____

(A) only electrons can participate.
(B) only holes can participate.
(C) both holes and electrons participate.
(D) none of the above.

c. UJT is a_____

(A) two-terminal two-junction semiconductor device.
(B) three-terminal two- junction semiconductor device.
(C) three-terminal one-junction semiconductor device.
(D) two-terminal one-junction semiconductor device.

d. A SCR can be operated_____

(A) only on reverse biased condition.
(B) only on forward biased condition.
(C) both reversed and forward biased condition.
(D) without any biasing.

e. A singe phase full wave fully controlled bridge rectifier uses_____

(A) 2 SCR **(B)** 3 SCR
(C) 4 SCR **(D)** 6 SCR

f. In a 3-phase full wave diode rectifier, if V is the per phase input voltage, then average output is given by_____

(A) 0.955 V. **(B)** 1.35 V.
(C) 2.34 V. **(D)** 3 V.

g. In a Current Source Inverter (CSI), if frequency of output voltage is f Hz, then the frequency of voltage input to CSI is_____

(A) f **(B)** 3f
(C) f/2 **(D)** 2f

h. Cycloconvertor are used for situation demanding_____

(A) very high frequency. **(B)** low frequency.
(C) high frequency. **(D)** very low frequency.

i. Duty cycle of a chopper circuit is expressed by_____

(A) T_{on} / T_{off} **(B)** $T_{on} / (T_{on} + T_{off})$
(C) $(T_{on}+T_{off}) / T_{off}$ **(D)** T_{off} / T_{on}

j. A snubber circuit is used in the thyristorised control circuit to overcome the effect of_____

(A) heating due to high voltage AC. **(B)** electromagnetism.
(C) transient in the ac supply. **(D)** corona.

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

Q.2 a. Discuss and compare the V-I characteristics of power diode and ideal diode. **(8)**

b. Classify the power diodes according to their reverse recovery characteristics and explain any one in brief. **(8)**

Q.3 a. Draw and explain the switching characteristics of an Insulated-Gate Bipolar Transistors. **(8)**

b. Explain with the help of a diagram, the construction and working principle of UJT. **(8)**

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Q.4 a. Describe the V-I Characteristics of an SCR and mark the various state voltages and currents on the first and third quadrants. **(8)**

b. A SCR circuit has dc supply voltage of 400 V, Turn-off time of 220 μs and load resistance of 40 Ω. Find the minimum value of capacitance that will ensure commutation. **(8)**

Q.5 a. Draw the circuit diagram of 3- phase full wave half controlled bridge rectifier and describe its operation. **(8)**

b. A 3-phase fully controlled bridge rectifier is fed by 400 V 3phase 50 Hz supply. The average load current is 150 A and load is inductive. The first angle is 60°, then find **(8)**

(i) Output Power (P_{dc}).
(ii) Average, RMS and Peak current through thyristors.
(iii) Peak Inverse Voltage.

Q.6 a. Describe the principle of operation of basic dc chopper and derive an expression for its average output voltage. **(8)**

b. The input voltage applied to basic step down chopper circuit is 200 V and the load consist of resistor of 20 Ω and inductance of 100 mH, the switching frequency is f=1kHz and ON time is 0.5 ms, if the average current is 1A, find the following **(8)**

(i) duty cycle
(ii) output current
(iii) output power
(iv) output load voltage
(v) minimum value of L required

Q.7 a. Draw the circuit diagram of a full bridge Voltage Source Inverters and sketch the firing pulses and output voltage waveforms. **(8)**

b. In a three phase CSI, the input current flowing through is 30A and load phase angle is 60°, then find the RMS value of output line current and dc input voltage. **(8)**

Q.8 a. A single phase 110 V ac source ,control power to a 10Ω resistive load using integral cycle control and total period T= 24 cycles. Find **(8)**

(i) RMS output current
(ii) Max power
(iii) Average power
(iv) Duty cycle
(v) T_{ON}

b. List five advantages of semiconductor switches over mechanical switches. **(4)**

c. Write short note on Hybrid Switch. **(4)**

Q.9 a. Draw the circuit diagram of single phase full wave half controlled bridge rectifier and sketch the voltage and current wave shapes for inductive load. **(8)**

b. A SCR full wave rectifier supplies to load of 100 Ω, if the peak ac voltage between centre tap and one end of secondary is 200 V, find DC output voltage V_{dc} and load current for a firing angle of 60°. **(8)**