



BRAINWARE UNIVERSITY

Term End Examination 2021 - 22

Programme – Diploma in Electronics & Communication Engineering

Course Name – Power Electronics

Course Code - DECE605C

(Semester VI)

Time allotted : 1 Hrs.15 Min.

Full Marks : 60

[The figure in the margin indicates full marks.]

Group-A

(Multiple Choice Type Question)

1 x 60=60

Choose the correct alternative from the following :

- (1) In a three-phase half wave rectifier usually, the primary side of the transformer is delta connected because

a) it has no neutral connection	b) we can get greater output voltage
c) it provides a path for the triplen harmonics	d) it provides better temperature stability
- (2) In a three-phase half wave diode rectifier using 3 diodes, each diode conducts for

a) 90 degrees	b) 120 degrees
c) 180 degrees	d) 360 degrees
- (3) In a three-phase half wave 6-pulse mid-point type diode rectifier, each diode conducts for

a) 120°	b) 60°
c) 90°	d) 180°
- (4) A 3-phase bridge rectifier, has the average output voltage as 286.48 V. Find the maximum value of line voltage

a) 100 V	b) 200 V
c) 300 V	d) 400 V
- (5) In a single pulse semi-converter using two SCRs, the triggering circuit must produce

a) two firing pulses in each half cycle	b) one firing pulse in each half cycle
c) three firing pulses in each cycle	d) one firing pulse in each cycle
- (6) In the complete firing circuit, the driver circuit consists of

a) pulse generator & power supply	b) gate leads & power supply
c) pulse amplifier & pulse transformer	d) pulse detector & pulse amplifier
- (7) The magnitude of gate voltage and gate current for triggering an SCR is

a) inversely proportional to the temperature	b) directly proportional to the temperature
c) inversely proportional to the anode current requirement	d) directly proportional to the anode current requirement
- (8) The major function of the pulse transformer is to

- a) increase the voltage amplitude
b) reduce harmonics
- c) isolate low & high power circuit
d) create periodic pulses
- (9) A p-type semiconductor material is doped with _____ impurities whereas a n-type semiconductor material is doped with _____ impurities
- a) acceptor, donor
b) acceptor, acceptor
c) donor, donor
d) donor, acceptor
- (10) The n-region has a greater concentration of _____ as compared to the p-region in a P-N junction diode.
- a) holes
b) electrons
c) both holes & electrons
d) phonons
- (11) In the p & n regions of the p-n junction the _____ & the _____ are the minority charge carriers respectively.
- a) holes, holes
b) electrons, electrons
c) holes, electrons
d) electrons, holes
- (12) Which of the following is true in case of an unbiased p-n junction diode?
- a) Diffusion does not take place
b) Diffusion of electrons & holes goes on infinitely
c) There is zero electrical potential across the junctions
d) Charges establish an electric field across the junctions
- (13) An ideal power diode must have
- a) low forward current carrying capacity
b) large reverse breakdown voltage
c) high ohmic junction resistance
d) high reverse recovery time
- (14) Power diode is _____
- a) a three terminal semiconductor device
b) a two terminal semiconductor device
c) a four terminal semiconductor device
d) a three terminal analog device
- (15) Which of the following is true in case of a power diode with R load?
- a) I grows almost linearly with V
b) I decays almost linearly with V
c) I is independent of V
d) I initial grows than decays
- (16) A diode is said to be forward biased when the
- a) cathode is positive with respect to the anode
b) anode is positive with respect to the cathode
c) anode is negative with respect to the anode
d) both cathode & anode are positive
- (17) A power diode with small softness factor (S-factor) has
- a) small oscillatory over voltages
b) large oscillatory over voltages
c) large peak reverse current
d) small peak reverse current
- (18) At turn-on the initial delay or turn on delay is the time required for the
- a) input inductance to charge to the threshold value
b) input capacitance to charge to the threshold value
c) input inductance to discharge to the threshold value
d) input capacitance to discharge to the threshold value
- (19) Choose the correct statement
- a) MOSFET suffers from secondary breakdown problems
b) MOSFET has lower switching losses as compared to other devices
c) MOSFET has high value of on-state resistance as compared to other devices
d) All of the mentioned
- (20) Which among the following devices is the most suited for high frequency applications?
- a) BJT
b) IGBT
c) MOSFET
d) SCR
- (21) For a MOSFET $V_{gs}=3V$, $I_{dss}=5A$, and $I_d=2A$. Find the pinch of voltage V_p
- a) 4.08
b) 8.16

- c) 16.32
- (22) The basic advantage of the CMOS technology is that
- a) It is easily available
b) It has small size
c) It has lower power consumption
d) It has better switching capabilities
- (23) The MOSFET combines the areas of _____ & _____
- a) field effect & MOS technology
b) semiconductor & TTL
c) mos technology & CMOS technology
d) none of the mentioned
- (24) The arrow on the symbol of MOSFET indicates
- a) that it is a N-channel MOSFET
b) the direction of electrons
c) the direction of conventional current flow
d) that it is a P-channel MOSFET
- (25) The controlling parameter in MOSFET is
- a) V_{ds}
b) I_g
c) V_{gs}
d) I_s
- (26) In the internal structure of a MOSFET, a parasitic BJT exists between the
- a) source & gate terminals
b) source & drain terminals
c) drain & gate terminals
d) there is no parasitic BJT in MOSFET
- (27) In the transfer characteristics of a MOSFET, the threshold voltage is the measure of the
- a) minimum voltage to induce a n-channel/p-channel for conduction
b) minimum voltage till which temperature is constant
c) minimum voltage to turn off the device
d) none of the above mentioned is true
- (28) The output characteristics of a MOSFET, is a plot of
- a) I_d as a function of V_{gs} with V_{ds} as a parameter
b) I_d as a function of V_{ds} with V_{gs} as a parameter
c) I_g as a function of V_{gs} with V_{ds} as a parameter
d) I_g as a function of V_{ds} with V_{gs} as a parameter
- (29) A power transistor is a
- a) three layer, three junction device
b) three layer, two junction device
c) two layer, one junction device
d) four layer, three junction device
- (30) A power transistor is a _____ device.
- a) two terminal, bipolar, voltage controlled
b) two terminal, unipolar, current controlled
c) three terminal, unipolar, voltage controlled
d) three terminal, bipolar, current controlled
- (31) In a power transistor, the I_B vs V_{BE} curve is
- a) a parabolic curve
b) an exponentially decaying curve
c) resembling the diode curve
d) a straight line $Y = IB$
- (32) The forward current gain α is given by
- a) I_C/I_B
b) I_C/I_E
c) I_E/I_C
d) I_E/I_B
- (33) A power BJT is used as a power control switch by biasing it in the cut off region (off state) or in the saturation region (on state). In the on state
- a) both the base-emitter & base-collector junctions are forward biased
b) the base-emitter junction is reverse biased, and the base collector junction is forward biased
c) the base-emitter junction is forward biased, and the base collector junction is reversed biased
d) both the base-collector & the base-emitter junctions are reversed biased
- (34) The power electronics devices have a very high efficiency because
- a) cooling is very efficient
b) the devices traverse active region at high speed & stays at the two states, on and off
c) the devices never operate in active region
d) the devices always operate in the active region
- (35) High frequency operation of any device is limited by the

- a) forward voltage rating
c) thermal conductivity
- b) switching losses
d) heat Sink arrangements
- (36) A 1mv of i/p gives an output of 1V, the voltage gain as such would be
a) 0.001
b) 0.0001
c) 1000
d) 100
- (37) IGBT possess
a) low input impedance
b) high input impedance
c) high on-state resistance
d) second breakdown problems
- (38) The three terminals of the IGBT are
a) base, emitter & collector
b) gate, source & drain
c) gate, emitter & collector
d) base, source & drain
- (39) The controlling parameter in IGBT is the
a) IG
b) VGE
c) IC
d) VCE
- (40) The voltage blocking capability of the IGBT is determined by the
a) injection layer
b) body layer
c) metal used for the contacts
d) drift layer
- (41) The structure of the IGBT is a
a) P-N-P structure connected by a MOS gate
b) N-N-P-P structure connected by a MOS gate
c) P-N-P-N structure connected by a MOS gate
d) N-P-N-P structure connected by a MOS gate
- (42) When latch-up occurs in an IGBT
a) Ig is no longer controllable
b) Ic is no longer controllable
c) the device turns off
d) Ic increases to a very high value
- (43) The static V-I curve of an IGBT is plotted with
a) Vce as the parameter
b) Ic as the parameter
c) Vge as the parameter
d) Ig as the parameter
- (44) The approximate equivalent circuit of an IGBT consists of
a) a BJT & a MOSFET
b) a MOSFET & a MCT
c) two BJTs
d) two MOSFETs
- (45) The body of an IGBT consists of a
a) p-layer
b) n-layer
c) p-n layer
d) metal
- (46) At present, the state-of-the-art semiconductor devices are begin manufactured using
a) Semiconducting Diamond
b) Gallium-Arsenide
c) Germanium
d) Silicon-Carbide
- (47) Which terminal does not belong to the SCR?
a) Anode
b) Gate
c) Base
d) Cathode
- (48) An SCR is a
a) four layer, four junction device
b) four layer, three junction device
c) four layer, two junction device
d) three layer, single junction device
- (49) Choose the false statement.
a) SCR is a bidirectional device
b) SCR is a controlled device
c) In SCR the gate is the controlling terminal
d) SCR are used for high-power applications
- (50) In the SCR structure the gate terminal is located

- a) near the anode terminal
 c) in between the anode & cathode terminal
- b) near the cathode terminal
 d) none of the mentioned
- (51) The static V-I curve for the SCR is plotted for
- a) I_a (anode current) vs I_g (gate current), V_a (anode – cathode voltage) as a parameter
 c) V_a vs I_g with I_a as a parameter
- b) I_a vs V_a with I_g as a parameter
 d) I_g vs V_g with I_a as a parameter
- (52) If the cathode of an SCR is made positive with respect to the anode & no gate current is applied then
- a) all the junctions are reversed biased
 c) only the middle junction is forward biased
- b) all the junctions are forward biased
 d) only the middle junction is reversed biased
- (53) With the anode positive with respect to the cathode & the gate circuit open, the SCR is said to be in the
- a) reverse blocking mode
 c) forward blocking mode
- b) reverse conduction mode
 d) forward conduction mode
- (54) The forward break over voltage is the
- a) anode-cathode voltage at which conduction starts with gate signal applied
 c) gate voltage at which conduction starts with no anode-cathode voltage
- b) anode-cathode voltage at which conduction starts with no gate signal applied
 d) gate voltage at which conduction starts with anode-cathode voltage applied
- (55) For a forward conducting SCR device, as the forward anode to cathode voltage is increased
- a) the device turns on at higher values of gate current
 c) the forward impedance of the device goes on increasing
- b) the device turns on at lower values of gate current
 d) the forward impedance of the device goes on decreasing
- (56) A thyristor can be brought from the forward conduction mode to forward blocking mode by
- a) the dv/dt triggering method
 c) applying a positive gate signal
- b) applying a negative gate signal
 d) applying a reverse voltage across anode-cathode terminals
- (57) Usually the forward voltage triggering method is not used to turn-on the SCR because
- a) it increases losses
 c) it may damage the junction & destroy the device
- b) it causes noise production
 d) relatively it's an inefficient method
- (58) The forward break over voltage is maximum when
- a) Gate current = ∞
 c) Gate current = $-\infty$
- b) Gate current = 0
 d) It is independent of gate current
- (59) The value of anode current required to maintain the conduction of an SCR even though the gate signal is removed is called as the
- a) holding current
 c) switching current
- b) latching current
 d) peak anode current
- (60) In the reverse blocking mode the middle junction (J_2) has the characteristics of that of a
- a) transistor
 c) inductor
- b) capacitor
 d) inductor