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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 off 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
c) 1000
b) 0.0001
d) 100
- (37) IGBT possess
a) low input impedance
c) high on-state resistance
b) high input impedance
d) second breakdown problems
- (38) The three terminals of the IGBT are
a) base, emitter & collector
c) gate, emitter & collector
b) gate, source & drain
d) base, source & drain
- (39) The controlling parameter in IGBT is the
a) I_G
c) I_C
b) V_{GE}
d) V_{CE}
- (40) The voltage blocking capability of the IGBT is determined by the
a) injection layer
c) metal used for the contacts
b) body layer
d) drift layer
- (41) The structure of the IGBT is a
a) P-N-P structure connected by a MOS gate
c) P-N-P-N structure connected by a MOS gate
b) N-N-P-P 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) I_g is no longer controllable
c) the device turns off
b) I_c is no longer controllable
d) I_c increases to a very high value
- (43) The static V-I curve of an IGBT is plotted with
a) V_{ce} as the parameter
c) V_{ge} as the parameter
b) I_c as the parameter
d) I_g as the parameter
- (44) The approximate equivalent circuit of an IGBT consists of
a) a BJT & a MOSFET
c) two BJTs
b) a MOSFET & a MCT
d) two MOSFETs
- (45) The body of an IGBT consists of a
a) p-layer
c) p-n layer
b) n-layer
d) metal
- (46) At present, the state-of-the-art semiconductor devices are begin manufactured using
a) Semiconducting Diamond
c) Germanium
b) Gallium-Arsenide
d) Silicon-Carbide
- (47) Which terminal does not belong to the SCR?
a) Anode
c) Base
b) Gate
d) Cathode
- (48) An SCR is a
a) four layer, four junction device
c) four layer, two junction device
b) four layer, three junction device
d) three layer, single junction device
- (49) Choose the false statement.
a) SCR is a bidirectional device
c) In SCR the gate is the controlling terminal
b) SCR is a controlled device
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