



# ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ ਜਲੰਧਰ

## PUNJAB TECHNICAL UNIVERSITY JALANDHAR

Max. Marks: 90

Time: 90 Mins.

### Entrance Test for Enrollment in Ph.D. Programme

#### Important Instructions

- Fill all the information in various columns, in capital letters, with blue/black ball point pen.
- Use of calculators is not allowed.
- All questions are compulsory. No negative marking for wrong answers.
- Each question has only one right answer.
- Questions attempted with two or more options/answers will not be evaluated.

Stream (Engg./Arch./Pharm./Mgmt./App.Sci./Life Sci.)

**ENGINEERING**

Discipline / Branch

**Electrical Engineering**

Name

Father's Name

Roll No.

Date

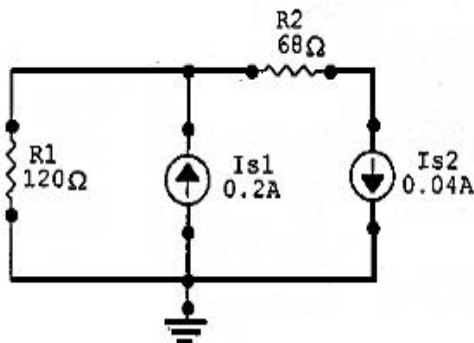
Signature of Candidate

Signature of Invigilator

Q1. The bridge method commonly used for finding mutual inductance is:

- (a) Heaviside Campbell Bridge
- (b) Schering Bridge
- (c) De Sauty Bridge
- (d) Wien Bridge

Q2. Referring to circuit given, if  $R_1$  is changed to a  $68 \Omega$  resistor, what will be the current through it?



- (a) 0.16 A
- (b) 0.24 A

- (c) 0.2 A
- (d) 0.04 A

Q3. A 12 mA current source has an internal resistance,  $R_s$ , of  $1.2 \text{ k}\Omega$ . The equivalent voltage source is:

- (a) 144 V
- (b) 14.4 V
- (c) 7.2 V
- (d) 72 mV

Q4. The slip of an induction motor normally does not depend on

- (a) Rotor speed
- (b) Synchronous speed
- (c) Shaft Torque
- (d) Core-loss component

Q5. The typical ratio of latching current to holding current in a 20 A thyristor is

- (a) 5.0
- (b) 2.0
- (c) 1.0
- (d) 0.5

Q6. Lagging of magnetization or induction flux density  $B$  behind the magnetizing force  $H$  is known as

- (a) magnetic permeability
- (b) magnetic hysteresis
- (c) magnetic induction
- (d) saturation

Q7. In an RL series circuit, with an applied voltage of 230 volts,  $R=20$  ohms,  $L=0.1$  Henry, the inductive reactance  $X_L$  is

- (a) 37.7
- (b) 31.4
- (c) 3.14
- (d) 314

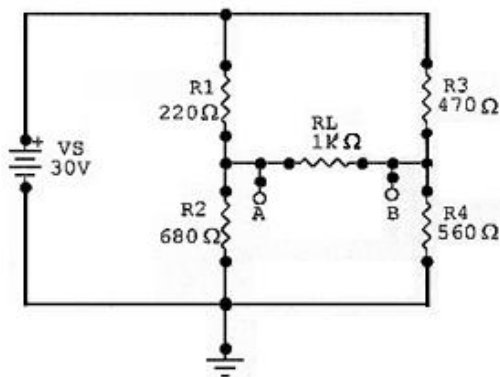
Q8. An RLC series circuit having  $R=6$  ohm,  $X_L=10$  ohm,  $X_C=12$  ohm. What is the total impedance of the circuit?

- (a)  $6 + j10$
- (b)  $6 - j12$
- (c)  $6 + j22$
- (d)  $6 - j2$

Q9. Three equal resistances of 3 ohms are connected in delta. The star equivalent value of resistance in ohms is

- (a) 6
- (b) 9
- (c) 1
- (d) 3

Q10. What is the Thevenin equivalent ( $V_{TH}$  and  $R_{TH}$ ) for the circuit given?



- (a) 6.4 V, 422
- (b) 6.4 V, 560

- (c) 6.4 V, 680
- (d) 30 V, 422

Q11. The rectification efficiency of a half wave rectifier for 230 V, 50 Hz input will be

- (a) equal to
- (b) twice
- (c) half of
- (d) four times

Q12. If the base is thinner and lightly doped the the

- (a) value of d.c. alpha will exceed unity
- (b) value of d.c. alpha will decrease
- (c) greater is the value of d.c. alpha but less than 1
- (d) existence of d.c. alpha will vanish

Q13. A wide band amplifier ranges within the frequency range of

- (a) up to a few MHz
- (b) up to a few khz
- (c) 30 Hz to about 15 Hz
- (d) up to 100 Hz only

Q14. A wien bridge oscillator has  $R_1=R_2=100$  K and  $C_1=C_2=210$  pF. The frequency of oscillations will be

- (a) 7.75 kHz
- (b) 7.57 kHz
- (c) 7.57 MHz
- (d) 75.7 kHz

Q15. When a.c. power is given to a load through two SCRs connected in an antiparallel, power control is achieved

- (a) by phase control on positive half cycle
- (b) by phase control on negative half cycle
- (c) by phase width control on both positive and negative half cycles

- (d) by phase width control on either positive or negative half cycle
- Q16. Skin depth is the distance from the conductor surface where the field strength has fallen to
- $\pi$  of its strength at the surface
  - $e$  of its strength at the surface
  - $(1/e)$  of its strength at the surface
  - $(1/\pi e)$  of its strength at the surface
- Q17. What is the effect of lag compensator on the system bandwidth and the signal-to-noise ratio?
- Bandwidth is increased and signal-to-noise ratio is improved
  - Bandwidth is increased and signal-to-noise ratio is deteriorated
  - Bandwidth is reduced and signal-to-noise ratio is deteriorated
  - Bandwidth is reduced and signal-to-noise ratio is improved
- Q18. The following point charges are located in air:
- +0.008 $\mu$ C at (0, 0) m
  - +0.05 $\mu$ C at (3, 0) m
  - 0.009 $\mu$ C at (0, 4) m
- The total electric flux over a sphere of 5 m radius with centre (0, 0) is
- 0.058 $\mu$ C
  - 0.049 $\mu$ C
  - 0.029 $\mu$ C
  - 0.016 $\mu$ C
- Q19. If a high frequency AC signal, whose r.m.s. value is 2V, is applied to a PMMC Instrument, then the reading of the instrument will be
- 2 V
  - 2 V
  - 1 V
  - zero
- Q20. A single-phase energy meter having meter constant of 200 rev/kWh is operating on 230V, 50 Hz supply with a load of 10 A, and at unity power factor for three hours continuously. The number of revolutions shown by the meter during this period is
- 13800
  - 1380
  - 276
  - 138
- Q21. The response  $y(t)$  of a linear system to an excitation  $x(t) = e^{-3t}u(t)$  is  $y(t) = (2t+1)e^{-2t}u(t)$ . Poles and zeros will be at
- 1, -1 and -2, -2
  - 2, -2 and -3, -4
  - 3, -3 and -4, -5
  - None of the above
- Q22. Good voice reproduction via PCM requires 128 quantization levels. If bandwidth of voice channel is 4 kHz, then data rate is
- 250 kbps
  - 128 kbps
  - 56 kbps
  - 28 kbps
- Q23. The instruction PCHL in 8085 is used for
- Load PC with contents of HL
  - Load HL with contents of memory location pointed by PC

- (c) Load HI with contents of PC  
 (d) Load PC with the contents of memory location pointed by HL pair
- Q24. The following is not true for RS232 standard:
- (a) It establishes the way data is coded  
 (b) It defines signal voltage levels  
 (c) Does not decide data transmission rate  
 (d) It defines standard connector configurations
- Q25. In double sideband suppressed carrier modulation, the modulated wave undergoes phase reversal, whenever
- (a) Modulating signal's amplitude decreases  
 (b) Modulating signal's amplitude increases  
 (c) Modulating signal crosses zero  
 (d) Carrier signal crosses zero
- Q26. The maximum deviation allowed in a frequency modulation system is 100 kHz; the modulating signal frequency is 10 kHz. The bandwidth requirement as per Carson's rule will be
- (a) 220 kHz  
 (b) 110 kHz  
 (c) 120 kHz  
 (d) 210 kHz
- Q27. A 6 – pole, 50 Hz, 3 – phase induction motor with a rotor resistance of  $0.25\Omega$  develops a maximum torque of 10 Nm at 875 rpm. The rotor reactance and slip at maximum torque is
- (a)  $2\Omega$  and 0.125 pu  
 (b)  $2\Omega$  and 0.25 pu  
 (c)  $1\Omega$  and 0.25 pu  
 (d)  $1\Omega$  and 0.125 pu
- Q28. The rotor frequency of a 3 – phase, 5 kW, 400 V, 50 Hz, 4 – pole slip ring induction motor is 25 Hz. The speed of the motor when connected to a 400 volt, 50 Hz supply will be
- (a) 1500 rpm  
 (b) 1000 rpm  
 (c) 750 rpm  
 (d) Zero
- Q29. A large synchronous generator is feeding power into an infinite bus at slightly lagging power factor. If a total loss of field occurs and the system can supply sufficient reactive power without a large terminal voltage drop, the unit will
- (a) Continue to run as a synchronous generator and no tripping is necessary  
 (b) Get short – circuited and it should be tripped instantaneously  
 (c) Run as an induction generator and it should be tripped after a time delay  
 (d) Run as a synchronous motor and it should be tripped after a time delay
- Q30. A 500 MW, 13.8 kV star connected synchronous generator at 0.8 PF will deliver a full load current of
- (a) 12.1 kA  
 (b) 21.0 kA  
 (c) 26.15 kA  
 (d) 46.5 kA
- Q31. A 4 – pole dc generator is running at 1500 rpm. The frequency of current in the armature winding is

- |            |           |
|------------|-----------|
| (a) 50 Hz  | (b) 300kW |
| (b) 150 Hz | (c) 500kW |
| (c) 25 Hz  | (d) 750kW |
| (d) 100 Hz |           |

Q32. The air – gap between the yoke and armature in a dc motor is kept small

- (a) To achieve a stronger magnetic field
- (b) To avoid overheating of the machine
- (c) To avoid locking of the armature
- (d) To avoid transverse motion

Q33. A 100 kVA, 2400 V/ 240 V, 50 Hz single phase transformer has an exciting current of 0.64 A and core loss 700 W when its high voltage side is energized at rated voltage and frequency. If load current is 40 A at 0.8 PF lagging on the LV side, then magnitude of the primary current will be

- (a) 4.58 A
- (b) 4 A
- (c) 4.64 A
- (d) 4.85 A

Q34. A 200 V/100 V, 50 Hz transformer is to be excited at 40 Hz from 100 V side. For the exciting current to be the same, the applied voltage should be

- (a) 150 V
- (b) 80 V
- (c) 100 V
- (d) 125 V

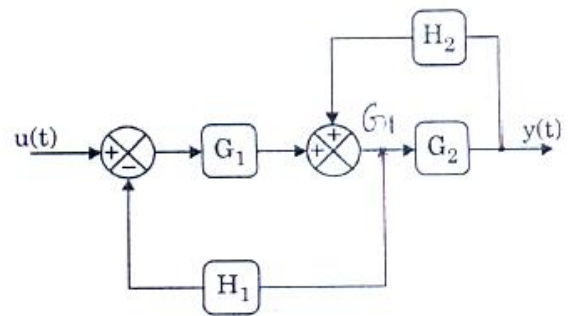
Q35. The utilizable water from a catchment is  $60 \times 10^6$  cu m annually and the hydro-station has head of 40m. Assuming ideal generator and turbine, the power that can be theoretically generated is

- (a) 250kW

Q36. In Gauss-Seidel load flow method, the number of iterations may be reduced if the correction in voltage at each bus is multiplied by

- (a) Gauss constant
- (b) Acceleration factor
- (c) Blocking factor
- (d) Lagrange multiplier

Q37.



The system transfer function for the block diagram shown is

- (a)  $G_1 G_2 / 1 - G_2 H_2 + G_1 H_1$
- (b)  $G_1 G_2 / 1 - H_1 G_1 + G_2 H_1$
- (c)  $G_1 G_2 H_1 / 1 + G_2 H_1 + G_1 H_1$
- (d)  $G_1 G_2 H_1 / 1 + G_2 H_2 + G_1 H_1$

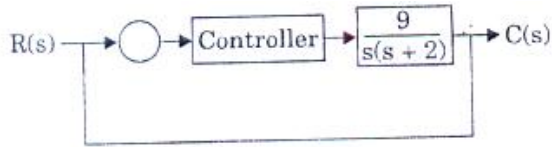
Q38. Consider the following statements regarding root loci plot:

1. When gain K is zero, the roots coincide with the poles.
2. When K is increased, the roots move away from the poles
3. A root locus diagram is always symmetric about the imaginary axis
4. The number of branches terminates on infinity is open loop poles plus zeros.

Which of these statements are correct?

- (a) 1 and 2
- (b) 2 and 3
- (c) 3 and 4
- (d) 1, 2, 3 and 4

Q39.



In the control system shown above the controller which can give zero steady- state error to a ramp input is of

- (a) proportional type
- (b) Integral type
- (c) Derivative type
- (d) Proportional plus derivative type

Q40. For a tachometer, if  $\theta(t)$  is the rotor displacement,  $e(t)$  is the output voltage and  $K$  is the tachometer constant, then the transfer function is defined as

- (a)  $1/Ks$
- (b)  $K/s$
- (c)  $Ks$
- (d)  $K$

Q41. In an HVDC system:

- (a) Both generation and distribution are dc
- (b) Generation is ac and distribution is dc
- (c) Generation is dc and distribution is ac
- (d) Both generation and distribution are ac

Q42. Dark current in a semiconductor photodiode is:

- (a) The forward bias current
- (b) The forward saturation current
- (c) The reverse saturation current

- (d) The transient current

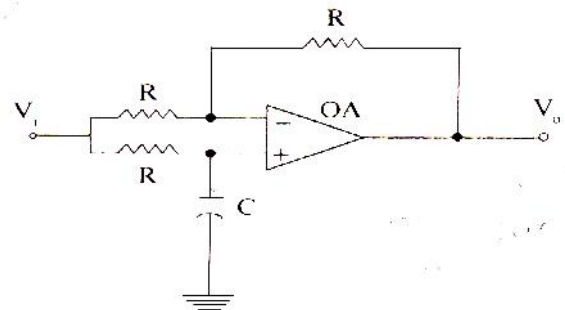
Q43. An emitter follower regulator has the following disadvantage:

- (a) It does not provide high gain
- (b) No provision exists for varying the output voltage
- (c) Its output resistance is high
- (d) It cannot withstand high load current

Q44. Which components are NOT found on chip in a microprocessor but may be found on chip in a microcontroller?

- (a) SRAM and USART
- (b) EPROM and PORTS
- (c) EPROM, USART and PORTS
- (d) SRAM, EPROM and PORTS

Q45.



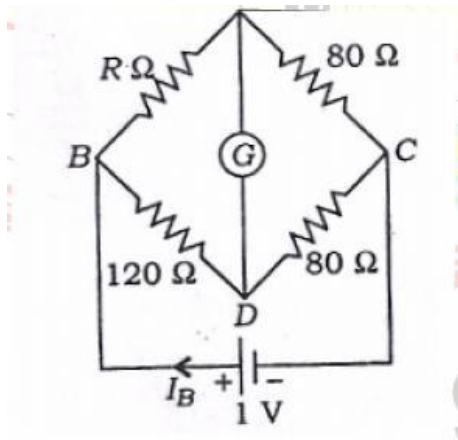
The circuit shown is:

- (a) A low pass filter
- (b) A high pass filter
- (c) A comparator
- (d) An all-pass filter

Q46. The number of independent KVL and KCL equations for a network with  $n$  nodes and  $l$  links are respectively

- (a)  $l$  and  $n$
- (b)  $l$  and  $n-1$
- (c)  $n-1$  and  $l$
- (d)  $n-1$  and  $l-1$

Q47.



In the circuit shown, when the current through the branch AD is zero, the battery current  $I_B$  is

- (a) 1 mA
- (b) 2 mA
- (c) 10 mA
- (d) 20 mA

Q48. An advantage of PMMC instrument is that it

- (a) is free from friction error
- (b) has high torque-to-weight ratio of moving parts
- (c) has low torque-to-weight ratio
- (d) can be used on both AC and DC

Q49. The presence of one of the following materials, in iron or steel for use as a magnetic material, tends to reduce the hysteresis loss

- (a) Carbon
- (b) Sulphur
- (c) Phosphorus
- (d) Silicon

Q50. The equation of continuity defines the relation between

- (a) electric field and magnetic field
- (b) electric field and charge density

- (c) flux density and charge density
- (d) current density and charge density

Q51. A negative sequence relay is commonly used to protect

- (a) an alternator
- (b) an transformer
- (c) a transmission line
- (d) a bus bar

Q52. For enhancing the power transmission in along EHV transmission line, the most preferred method is to connect a

- (a) Series inductive compensator in the line
- (b) Shunt inductive compensator at the receiving end
- (c) Series capacitive compensator in the line
- (d) Shunt capacitive compensator at the sending end

Q53. A dual trace oscilloscope is set to operate in the alternate mode. The control input of the multiplexer used in the y-circuit is fed with a signal having a frequency equal to

- (a) the highest frequency that the multiplexer can operate properly
- (b) twice the frequency of the time base (sweep) oscillator
- (c) the frequency of the time base (sweep) oscillator
- (d) half the frequency of the time base (sweep) oscillator

Q54. Circuit turn-off time of an SCR is defined as the time

- (a) taken by the SCR turn of required for the SCR current to become zero

- (c) for which the SCR is reverse biased by the commutation circuit
- (d) for which the SCR is reverse biased to reduce its current below the holding current
- Q55. A 4 – point starter is used to start and control the speed of a
- (a) dc shunt motor with armature resistance control
- (b) dc shunt motor with field weakening control
- (c) dc series motor
- (d) dc compound motor
- Q56. A three-phase, salient pole synchronous motor is connected to an infinite bus. It is operated at no load at normal excitation. The field excitation of the motor is first reduced to zero and then increased in reverse direction gradually. Then the armature current
- (a) Increases continuously
- (b) First increases and then decreases steeply
- (c) First decreases and then increases steeply
- (d) Remains constant
- Q57. A low – pass filter with a cut-off frequency of 30Hz is cascaded with a high-pass filter with a cut-off frequency of 20Hz. The resultant system of filters will function as
- (a) an all-pass filter
- (b) an all-stop filter
- (c) an band stop (band-reject) filter
- (d) a band – pass filter
- Q58. For a lossy transmission line, the characteristic impedance does not depend on
- (a) The operating frequency of the line
- (b) The conductivity of the conductors
- (c) Conductivity of the dielectric separating the conductors
- (d) Length of the line
- Q59. The Fermi level in an n-type semiconductor at zero degree Kelvin line
- (a) Below the Kelvin lies
- (b) Half-way between the conduction band and the donor level
- (c) Half-way between the conduction band and the valence level
- (d) Close to the valence band
- Q60. Which of the following types of errors come under systematic errors?
1. Irregular spring tension.
  2. Improper reading if an instrument
  3. Loading effects.
  4. Error due to the presence of electric field or magnetic field
- (a) 1 and 2
- (b) 2 and 3
- (c) 3 and 1
- (d) 4 and 1
- Q61. In a GTO, anode current begins to fall when the gate current:
- (a) Is negative peak at time  $t = 0$
- (b) Is negative peak at  $t =$  storage period  $t$
- (c) Just begins to become negative at  $t = 0$
- (d) Just begins to become positive at  $t = 0$
- Q62. A structure obtained by lightly doped n drift region between the layers of a pn junction a PIN diode is obtained. This structure is effective in:



- (a) Making the diode support large reverse blocking voltages
- (b) Making reverse recovery process slow
- (c) Making the diode have high on-state voltage drop
- (d) Reducing the voltage spike during turn off due to stray inductance
- Q63. In high speed TDM, the channels are separated in the receiver employing:
- (a) OR gate
- (b) NAND gate
- (c) NOR gate
- (d) AND gate
- Q64. The 'Equal area criterion' for the determination of transient stability of the synchronous machine connected to an infinite bus:
- (a) Ignores lines as well as synchronous machine resistances and shunt capacitances
- (b) Assumes accelerating power acting on the rotor as constant
- (c) Ignores the effect of voltage regulator and governor but considers the inherent damping present in the machine
- (d) Takes into consideration the possibility of machine losing synchronism after it has survived during the first swing.
- Q65. One shot multi-vibrator, with a pulse input gives an output:
- (a) A single triangular pulse
- (b) A square pulse
- (c) An impulse
- (d) A single sinusoid pulse
- Q66. When a steady current is passed through a ballistic galvanometer, then the deflection will be
- (a) maximum
- (b) zero
- (c) twice the normal value as it depends on Hibbert magnetic standard
- (d) None of the above
- Q67. The following material is not used for making a piezoelectric transducer
- (a) Rochelle salt
- (b) Barium titanate
- (c) Chlorium sulphide
- (d) Quartz
- Q68. Systematic error of an instrument for measurement can be minimized by
- (a) selecting a proper measuring device for the particular application
- (b) calibrating the measuring device against a standard device
- (c) applying correction factors for change of ambient conditions
- (d) carrying out all of the above
- Q69. The law/principle in mechanical systems, analogous to Kirchoff's laws in electrical systems, is
- (a) first law of motion
- (b) second law of motion
- (c) third law of motion
- (d) d'Alembert's principle
- Q70. If the phase margin of a unity feedback control system is zero, then the Nyquist plot of the system passes through
- (a) the origin in the GH plane
- (b) left-hand side of  $(-1, j0)$  point in the GH plane

- (c) exactly on  $(-1, j0)$  point in the GH plane  
 (d) in between origin and  $(-1, j0)$  point in the GH plane
- Q71. In a certain transformer, the input power to the primary is 120 W. If 8.5 W are lost to the winding resistance, what is the output power to the load, neglecting any other issues?  
 (a) 0 W  
 (b) 14.1 W  
 (c) 111.5 W  
 (d) 1,020 W
- Q72. In order to get maximum power transfer from a capacitive source, the load must  
 (a) have a capacitive reactance equal to circuit resistance  
 (b) have an impedance that is the complex conjugate of the source impedance  
 (c) be as capacitive as it is inductive  
 (d) none of the above
- Q73. In the power measurement by ammeter-voltmeter method, if the voltmeter is connected across the load, then the value of the power will be  
 (a) The power consumed by the load  
 (b) The sum of power consumed by the load and ammeter  
 (c) The sum of power consumed by the load and voltmeter  
 (d) The sum of power consumed by the load, ammeter and voltmeter
- Q74. A 0-100 V voltmeter has an accuracy of 1 percent at full-scale reading. What will be the error if it reads 50 V?  
 (a) 1 percent  
 (b) 2 percent  
 (c) 0.5 percent  
 (d) 4 percent
- Q75. In a vibrating reed type frequency meter, all the reeds  
 (a) Are of identical dimensions and weight  
 (b) Have different natural frequencies  
 (c) Have the same natural frequencies  
 (d) Are not placed close to an electromagnet
- Q76. A higher directivity is specified by  
 (a) High gain high bandwidth  
 (b) Low gain high bandwidth  
 (c) High gain low bandwidth  
 (d) Low gain low bandwidth
- Q77. If the maximum and minimum voltages on a transmission line are 4V and 2V, respectively, for a typical load, VSWR is  
 (a) 1.0  
 (b) 0.5  
 (c) 2.0  
 (d) 8.0
- Q78. A superconductor may be used for generating  
 (a) Voltage  
 (b) Pressure  
 (c) Temperature  
 (d) Magnetic field
- Q79. A 220 V, DC shunt motor is operating at a speed of 1440 rpm. The armature resistance is 1.0  $\Omega$  and armature current is 10A. If the excitation of the machine is reduced by 10%, the extra resistance to be put in the armature circuit to maintain the same speed and torque will be  
 (a) 1.79

- (b) 2.1  
(c) 18.9  
(d) 3.1
- Q80. The two vectors  $[1,1,1]$  and  $[1,a,a^2]$ , where  $a = [-1/2 + j \ 3/2]$ , are  
(a) Orthonormal  
(b) Orthogonal  
(c) Parallel  
(d) Collinear
- Q81. Roots of the algebraic equation  $X^3 + X^2 + X + 1 = 0$  are  
(a)  $(+1, +j, -j)$   
(b)  $(+1, -1, +1)$   
(c)  $(0, 0, 0)$   
(d)  $(-1, +j, -j)$
- Q82. With K as a constant, the possible solution for the first order differential equation  $dy/dx = e^{-3x}$  is  
(a)  $-1/3(e^{-3x}) + K$   
(b)  $-1/3(e^{3x}) + K$   
(c)  $1/3(e^{-3x}) + K$   
(d)  $-3e^{-x} + K$
- Q83. Among the following pairs, the one not correctly matched is  
(a) UJT – Intrinsic stand-off ratio  
(b) FET – Pinch-off voltage  
(c) TRIAC – Breakdown voltage  
(d) DIAC – Firing voltage
- Q84. Frequency frogging is used in carrier system to  
(a) Conserve frequencies  
(b) Reduce distortion  
(c) Reduce cross talk  
(d) Reduce bandwidth
- Q85. DPCM is particularly suited for  
(a) Radar signals transmission  
(b) Radio signals transmission  
(c) Speech signals transmission  
(d) Seismic signals transmission
- Q86. A Pelton wheel turbine having a rated speed of 300 rpm is connected to an alternator to produce power at 50 Hz. The number of poles required in the alternator is  
(a) 4  
(b) 8  
(c) 10  
(d) 20
- Q87. The overall efficiency of a dc shunt generator is maximum when its variable loss equals  
(a) The stray loss  
(b) The iron loss  
(c) Constant loss  
(d) Mechanical loss
- Q88. A 500 MW, 13.8 kV star connected synchronous generator at 0.8 PF will deliver a full load current of  
(a) 12.1 kA  
(b) 21.0 kA  
(c) 26.15 kA  
(d) 46.5 kA
- Q89. In a dc machine running with a heavy load, and with the brushes located on the geometrical neutral axis, sparking occurs at the brushes during commutation, because of  
(a) The high current – density at the coil – ends  
(b) The centrifugal force exerted on the brushed by the commutator  
(c) The shifting of the magnetic neutral axis  
(d) The reduced main – field flux – density in the inter – Polar regions
- Q90. The function  $f(x) = 2x - x^2 - x^3 + 3$  has  
(a) a maxima at  $x = 1$  and minimum at  $x = 5$

- (b) a maxima at  $x = 1$  and  
minimum at  $x = -5$
- (c) only maxima at  $x = 1$  and
- (d) only a minimum at  $x = 5$