MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA
ANSWER KEY <u>ELECTRICAL ENGINEERING</u>

1. c
2. d
3. d
4. a
5. c
6. d
7. d
8. d
9. d
10. b
11. b
12. b
13. c
14. b
15. a
16. c
17. d
18. d
19. b
20. c
21. a
22. b
23. b
24. c
25. c
26. b
27. b
28. d
29. a
30. d
31. b
32. b
33. b
34. a
35. a
36. b
37. b
38. c
39. d
40. b

14/1/25
Controller of Examinations
MRSPTU, Bathinda

Q1. The Eigen values of the matrix $\begin{bmatrix} 4 & -2 \\ -2 & 1 \end{bmatrix}$

    a) are 1 and -4
    b) are -1 and 2
    c) are 0 and 5
    d) cannot be determined

Q2. The optimum value of function $f(x) = x^2 - 4x + 2$ is
    a) 2(maximum)
    b) 2(minimum)
    c) -2(maximum)
    d)-2(minimum)

Q3. A class of first year B.Tech students is composed of four batches A,B,C and D, each consisting of 30 students. It is found that the sessional marks of students in Basic Electrical Engineering in batch C have a mean of 6.6 and standard deviation of 2.3. The mean and standard deviation of marks for the entire class are 5.5 and 4.2 respectively. It is decided by course instructor to normalize the marks of the students of all batches to have the same mean and standard deviation as that of entire class. Due to this, the marks of the student in batch C are changed from 8.5 to
    a) 6.0   b) 7.0
    c) 8.0   d) 9.0

Q4. If $f(t) = F(s)$, then $f(t-T)$ is
    a) $e^{sT}F(S)$
    b) $e^{-sT}F(S)$
    c) $F(s)/1+e^{sT}$
    d) $F(s)/1-e^{-sT}$

Q5. Superposition Theorem is not applicable to
    a) Voltage Calculations
    b) Bilateral Elements
    c) Power Calculations
    d) Passive elements

Q6. How many 200W/220V incandescent lamps connected in series would consume same total power as a single 100W/220V incandescent lamp?
    a) not possible   b) 4
    c) 3   d) 2

Q7. Which of the following are conditions for a two port network to be reciprocal one?
1. $Z_{12} = Z_{21}$ 2. $Y_{12} = Y_{21}$ 3. $h_{12} = -h_{21}$
Select the correct consitions from the code given below:
    a) Only 1 and 2
    b) Only 2 and 3
    c) Only 1 and 3
    d) 1,2 and 3

Q8. Which of the following relations for power is not correct?

a) $P=VI\cos\phi$

b) $P=$ Re part of $[VI^*]$

c) $P=$ Re part of $[V^*I]$

d) $P=VI\sin\phi$

Q9. What is the effect of inductance of a coil on a constant direct current?

a) It decreases the current

b) It increase the current

c) It causes higher voltage drop

d) It does not effect the constant direct current

Q10. A uniform plane wave will have components of

a) E and H is zero in direction perpendicular to the direction of propagation

b) E and H exists only in direction perpendicular to the direction of propagation

c) E exists in direction of propagation , while H is zero

d) both E and H exist in all directions

Q11. Surface integral of electric field intensity is

a) electrical charge

b) net flux emanating from the surface

c) differential of volume flux

d) Both a and b

Q12. Select the equation which is not Maxwell

a) $D=\mathcal{E}E$

b) $E=\varepsilon D$

c) $J=\sigma E$

d) $B=\mu H$

Q13. In a 100kVA 1100/220V 50Hz 1ϕ transformer with 2000 turns on the h.v. side, the OCT result gives 200V, 91A, 5kW on LV side. The core loss component of current is approximately:

a) 9.1A

b) 22.7A

c) 25A

d) 91A

Q14. Wave winding is employed in a d.c.machine of

a) High current and low voltage rating

b) Low current and high voltage rating

c) High current and high voltage rating

d) low current and low voltage rating

Q15. A 4 pole 50Hz synchronous generator has 48 slots in which a double layer winding is housed. Each coil has 10 turns and is short pitched by an angle of 36° electrical. The fundamental flux per pole is 0.25Wb. The line to line induced emf (in volts) for a three phase connection is approximately

a) 1143

b) 1332

c) 1617

d) 1791

Q16. A three phase 4 pole self excited induction generator is feeding power to a load at a frequency f_1. If the load is partially removed, the frequency becomes f_2. If the speed of generator is maintained at 1500rpm in both cases then

a) Both f_1, $f_2 > 50$Hz and $f_1 > f_2$

b) $f_1 < 50$Hz and $f_2 > 50$Hz

c) f_1, $f_2 < 50$Hz and $f_2 > f_1$

Q17. For a given base voltage and base volt-amp, the per unit impedance value of an element is X. What will be the value of this element when both the voltage and volt-amp bases are doubled?

a) 4X　　　　　　　　　　b) 2X

c) X　　　　　　　　　　　d) 0.5X

Q18. In an interconnected power system the most suitable power plant to meet the peak load conditions is

a) Hydel　　　　　　　　　b) Nuclear

c) Steam　　　　　　　　　d) Pumped Storage

Q19. The power transmission capability of bipolar lines is approximately

a) Half of 3 phase single circuit line

b) same as that of 3 phase single circuit line

c) Twice that of 3 phase single circuit line

d) Thrice that of 3 phase single circuit line

Q20. Consider the following statements regarding fault analysis

1. The neutral grounding impedance Z_n appears as $3Z_n$ in zero sequence equivalent circuit.
2. For faults on transmission lines,3 phase fault is the least severe amongst other faults.
3. The positive and negative sequences networks are not affected by method of neutral grounding.

Which of these statements are correct?

a) Only 1 and 2　　　　　　b) Only 2 and 3

c) Only 1 and 3　　　　　　d) 1,2 and 3

Q21. The z- trasnform of a signal x[n] is given by 4z-3+3z-1+2-6z2+2z3. It is applied to a system with transfer function H (z)= 3z-1-2. Let the output be y (n). Which of the following is true?

a) y(n) is non casual with finite support

b) y(n) is casual with infinite support.

c) y(n)=0; |n|>3

d) Re $[Y(z)]_{z=e^{j\Theta}}$ = -Re$[Y(z)]_{z=e^{-j\Theta}}$; Im$[Y(z)]_{z=e^{j\Theta}}$ = -Im$[Y(z)]_{z=e^{-j\Theta}}$; $-\Pi \leq \Theta \leq \Pi$

Q22. Let x(t)= rect (t-1/2) where rect(x)= 1 for $-1/2 \leq x \leq 1/2$ and zero otherwise. Then if sinc(x)= $\frac{\sin(\Pi x)}{\Pi x}$, the Fourier transform of x(t)+x(-t) will be given by

a) sinc ($\frac{\omega}{2\Pi}$)

b) 2sinc ($\frac{\omega}{2\Pi}$)

c) 2sinc ($\frac{\omega}{2\Pi}$)cos($\frac{\omega}{2}$)

d) sinc ($\frac{\omega}{2\Pi}$)cos($\frac{\omega}{2}$)

Q23. A cascade of 3 linear Time Invariant systems is casual and unstable. From this we conclude that

a) each system in the cascade is individually casual and unstable

b) at least one system is unstable and at least one system is casual

c) at least one system is casual and all systems are unstable

d) the majority are unstable and the majority are casual.

Q24. If u(t), r(t) denote the unit step and unit ramp functions respectively and u(t)*r(t) their convolution, then the function u(t+1)*r(t-2) is given by:
a) $(1/2)(t-1)(t-2)$
b) $(1/2)(t-1)u(t-2)$
c) $(1/2)(t-1)^2 u(t-1)$
d) None of the above

Q25. At an industrial sub-station with a 4MW load, a capacitor of 2MVAR is installed to maintain the load factor at 0.97 lagging. If the capacitor goes out of service, the load power factor becomes
a) 0.85 lag   b) 1.00
c) 0.80lag   d) 0.90lag

Q26.Choose the appropriate auxiliary components of HVDC transmission system from following
1. DC line inductor
2. AC line inductor
3. Reactive Power sources
4. distance relays on DC line
5. Series capacitance on AC lines
a) Only 1 and 2
b) Only 1 and 3
c) Only 2 and 4
d) Only 4 and 5

Q27. The neutral of 10MVA, 11kV alternator is earthed through a resistance of 5ohms. The earth fault relay is set to operate at 0.75A. The CT's have a ratio of 1000/5. what percentage of alternator winding is protected?
a) 85%   b) 88.2%
c) 15%   d) 11.8%

Q28. The parameters of transposed overhead transmission line are given as: self reactance $X_s=0.4\Omega$/km and mutual reactance $X_m= 0.1\Omega$/km. The positive sequence reactance X_1 and zero sequence reactance X_0 respectively in Ω/km are
a) 0.3, 0.2
b) 0.5, 0.2
c) 0.5, 0.6
d) 0.3, 0.6

Q29. The effect of stray magnetic fields on the actuating torque of a portable instrument is maximum when the operating field of the instrument and stray fields are
a) perpendicular
b) parallel
c) inclined at 60°
d) inclined at 30°

Q30. An average reading digital multimeter reads 10V when fed with a triangular wave, symetric about the time axis. For the same input an rms reading meter will read:
a) $20/\sqrt{3}$
b) $10/\sqrt{3}$
c) $20\sqrt{3}$
d) $10\sqrt{3}$

Q31. A 500/5A, 50Hz current transformer has a bar primary. The secondary burden is a pure resistance of 1Ω and it draws a current of 5A. If the magnetic core requires 250AT for magnetization, the percentage error is

a) 10.56

b) -10.56

c) 11.80

d) -11.80

Q32. The simultaneous application of signals x(t) and y(t) to the horizontal and vertical plates respectively of an oscilloscope, produces a vertical figure of 8 display. If P and Q are constants and $x(t) = Psin(4t+30)$, then y(t) is equal to

a) Qsin (4t-30)

b) Qsin(2t+15)

c) Qsin(8t+60)

d) Qsin(4t+30)

Q33. A three phase diode bridge rectifier is fed from a 400V RMS 50Hz three phase AC source. If the load is purely resistive, then peak instantaneous output voltage is equal to

a) 400V

b) $400\sqrt{2}$V

c) $400\sqrt{2}/3$

d) $400\sqrt{3}$

Q34.A step down chopper is operated in the continuous conduction mode in steady state with a constant duty ratio D. If V0 is the magnitude of dc output voltage and if Vs is the magnitude of dc input voltage, the ratio of V0/Vs is given as:

a) D

b) 1-D

c) 1/(1-D0

d) D/(1-D)

Q35. A three phase 440V 50Hz AC mains fed thyristor bridge is feeding a 440V Dc, 15kW 1500rpm separately excited dc motor with a ripple free continuous current in dc link under all operating conditions, neglecting losses, the power factor of the ac mains at half the rated speed is

a) 0.354

b) 0.372

c) 0.90

d) 0.955

Q36. A 3 phase voltage source inverter is operated in 180° conduction mode. Which one of the following statements is true?

a) Both pole- voltage and line voltage will have 3rd harmonic components

b) Pole voltage will have 3rd harmonic component but line voltage will be free from 3rd harmonic

c) Line voltage will have 3rd harmonic component but pole voltage will be free from 3rd harmonic

d) Both pole- voltage and line voltage will be free from 3rd harmonic components

Q37. The output Y of a 2 bit comparator is logic 1 whenever 2 bit input A is greater than 2 bit input B. The number of combinations for which the output is logic 1 is

a) 4   b) 6

c) 8   d) 10

Q38. A bulb in a stair case has two switches one switch being at ground floor and other one at first floor. The bulb can be turned ON and also can be turned OFF by any one of the switches irrespective of the state of the other switch. The logic of switching of bulb resembles
a) AND gate
b) OR gate
c) XOR gate
d) NAND gate

Q39. A low pass filter with a cut off frequency as 30Hz is cascaded with a high pass filter with a cut off frequency of 20Hz. The resultant system of filters function as
a) all pass filter
b) all stop filter
c) band stop filter
d) band pass filter

Q40. In a common emitter amplifier the un bypassed emitter resistance provides
a) Voltage shunt feedback
b) Current series feedback
c) Negative voltage feedback
d) Positive current feedback