12P

84/100

Booklet Code : **B**

Hall Ticket No.: 1 4 9 2 0 2 6 6

Booklet Code : 53398

Candidate's Name :

M.Raghava Reddy

EPDCL-2014

M. Raghava Reddy

Aditya

Signature of the Candidate ***Signature of the Invigilator***

INSTRUCTION TO CANDIDATES

1. Candidates should write their Hall Ticket Number and Name in the space provided on Question Paper Booklet and OMR Sheet with Ball point pen.
2. The Candidates should ensure that the Hall Ticket Number and Name of the Candidate are properly printed in the OMR Answer Sheet provided to them. The Candidates are also further instructed to darken the appropriate circles provided for the Hall Ticket Numbers, Category and Gender.
3. Changing an answer is NOT Allowed.
   - ➢ The Candidates must fully satisfy themselves about the accuracy of the answer before darkening the appropriate circle with Blue/Black Ball Point Pen, as it is not possible to change or erase once darkened.
   - ➢ Use of Eraser or White Fluid on the Answer Sheet is not permissible as the Answer Sheets are machine gradable and it may lead to wrong evaluation.
4. Immediately on opening this Question Paper Booklet, Check :
   (a) Whether 100 multiple choice Questions are printed.
   (b) In case of any discrepancy, immediately exchange the Question Paper Booklet with same code.
5. Use of Calculators, Mathematics Tables and Log books is not permitted.
6. One mark will be awarded for every correct answer. **There are no negative marks.**
7. Answer to the questions must be entered only on OMR Response Sheet by completely shading the appropriate circle with **Ball Point Pen (Blue or Black) only.**
8. The OMR Response Sheet will be invalidated if the circle is shaded using Pencil or if more than one circle is shaded against each question.
9. The OMR Response Sheet will not be valued if the candidate :
   (a) Writes the Hall Tickets Number in any part of the OMR Response Sheet expect in the space provided for the purpose.
   (b) Writes any irrelevant matter including religious symbols, words, prayers or any communication whatsoever in any part of the OMR Response Sheet.
   (c) Adopts any other malpractice.
10. Rough work should be done only in the space provided in the Question Paper Booklet.
11. No loose sheets or papers will be allowed in the examination hall.
12. Examination duration: **120** minutes.
13. Timings of Test : 11.00 A.M to 01.00 P.M
14. Candidate should ensure that he/she enters his/her Hall Ticket Number, name and appends signature on the Question Paper Booklet and also on the OMR Response Sheet in the space provided. Candidate should ensure that the invigilator puts his signature on the Question Paper Booklet and OMR Response Sheet.
15. Before leaving the examination hall, Candidate should **return the OMR Response Sheet and the candidates can retain carbon copy of OMR answer sheet and Question Paper Booklet.**
16. This booklet contains a total of **24** pages including Cover Page and the pages for Rough Work.

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Note: **(1)** Answer all questions
(2) Each question carries 1 mark. There are no negative marks.
(3) Answer to the questions must be entered only on OMR Response Sheet provided separately by Completely shading with **Ball Point Pen (Blue or Black) only.**
(4) The OMR Response Sheet will be invalidated if the circle is shaded using Pencil or if more than one circle is shaded against each question.

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2 1. Identify the instrument which has no controlling torque.

(1) Electrostatic Voltmeter
(2) Power factor meter
(3) Watt meter
(4) Dynamometer type Ammeter

$\frac{5\times220}{1000}\times\frac{60\times360}{3600}\times\frac{1}{600}$ 11×10^{3} 0.011

3 2. A 5A, 220V, Energy meter on full load, unity power factor, makes 60 revolutions in 360 secs. The constant of Energy meter is 600 resolutions per kWh. The error in the energy recorded is

(1) 0.02 kWh
(2) 0.05 kWh
(3) 0.01 kWh
(4) 0.1 kWh

60 → 360 $\frac{60}{360}$

$=\frac{5\times220}{1000}\times\frac{60\times360}{3600}\times\frac{1}{600}$

1 3. The instrument with good accuracy for measurement of A.C. quantities is

(1) Dynamometer type
(2) Moving Iron type
(3) Moving Coil type
(4) Induction type

$\frac{5\times220}{1000}\times\frac{60}{3600}\times\frac{1}{600}$

3 4. The Bridge network commonly employed for measurement of very low resistances is

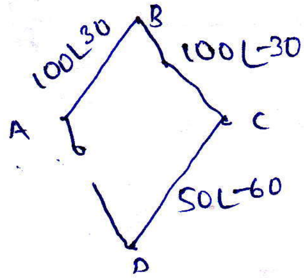
(1) Carey Foster's Bridge
(2) Wheat stone Bridge
(3) Kelvin's Double Bridge
(4) Schering Bridge

4 5. The Bridge network employed for measurement of mutual inductance is

(1) Wien's Bridge
(2) Owen's Bridge
(3) Anderson Bridge
(4) Heaviside Campbell Bridge

1 6. The four arms of bridge network has $Z_{AB} = 100\angle 30°\Omega$, $Z_{BC} = 100\angle -30°\Omega$. $Z_{CD} = 50\angle -60°\Omega$ and an unknown impedance is connected between D and A. Then unknown impedance Z_{DA} is

(1) $50\angle 0°\Omega$
(2) $100\angle 0°\Omega$
(3) $50\angle -120°\Omega$
(4) $200\angle 60°\Omega$



$\frac{100\times50\angle-30}{100\angle-30}$

$\frac{100\times100}{50}$

2 7. Wagner's earthing device is employed in A.C. bridge network to

(1) Shield the bridge elements

(2) Eliminate the effect of earth capacitances

(3) Eliminate the effect of stray magnetic field

(4) Eliminate the effect of stray electric fields

4 8. The transducer employed for measurement of angular displacement is

(1) LVDT (2) Thermocouple

(3) Thermistor (4) Circular Potentiometer

4 9. Thermistor is employed for measurement of

(1) Linear displacement (2) Acceleration

(3) Pressure (4) Temperature

2 10. The "Gauge factor" of a strain gauge is given by

(1) $\frac{\Delta L/L}{\Delta R/R}$ (2) $\frac{\Delta R/R}{\Delta L/L}$ (3) $\frac{\Delta R}{\Delta L}$ (4) $\frac{\Delta L}{\Delta R}$ $\frac{f_y}{f} = \frac{4}{6}$

2 11. A lissajous pattern on the oscilloscope has 6 vertical maximum values and 4 horizontal maximum values. The frequency of horizontal input is 1000 Hz. The frequency of the vertical input is

(1) 4000 Hz (2) 1500 Hz (3) 6000 Hz (4) $\frac{2000}{3}$ Hz

1 12. The cut in voltage for silicon and germanium diodes respectively is

(1) 0.6V, 0.2V (2) 0.7V, 0.3V (3) 0.3V, 0.7V (4) 0.2V, 0.6V

3 13. In a FET

(1) $r_d = \mu \times g_m$ (2) $r_d = \frac{g_m}{\mu}$

(3) $\mu = r_d \times g_m$ (4) $\mu = \frac{r_d}{g_m}$

14. The transistor amplifier in the following configuration is called emitter follower
(1) CB (2) CE (3) CC (4) Cascode

15. The Barkhausen criterion is
(1) $A = \beta$ (2) $A = -\beta$ (3) $A\beta = 1$ (4) $A\beta = -1$

16. The maximum conversion efficiency of a class B push pull amplifier is
(1) 10π (2) 15π (3) 20π (4) 25π

17. Which of the following is not an ideal op-amp characteristic?
(1) Infinite voltage gain (2) Infinite output resistance
(3) Infinite input resistance (4) Infinite bandwidth

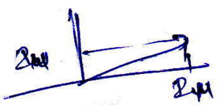
18. Which is a voltage to frequency convertor multivibrator?
(1) Bistable (2) Astable (3) Monostable (4) Schmitt trigger

19. The bandwidth of a low pass RC circuit is 1KHz. What is the rise time of output for a step input?
(1) 0.35 ms (2) 3.5 ms (3) 0.35s (4) 1ms

20. The gate whose output is high when all the inputs are low and low for other combinations of inputs is
(1) OR gate (2) AND gate (3) NAND gate (4) NOR gate

21. Which of the following is a D/A convertor?
(1) Flash convertor (2) Weighted resistor
(3) Successive approximation (4) Dual slope

22. Power factor of a transformer on no load is poor due to
(1) Magnetizing reactance of the transformer
(2) Open circuited secondary
(3) Low primary winding resistance
(4) Low no-load current



1 23. During short circuit test the core losses are negligible. This is because

(1) The voltage applied across the high voltage side is a fraction of its rated voltage and so the mutual flux

(2) The current on the low voltage side is very small

(3) The power factor is high

(4) Iron becomes fully saturated

3 24. The efficiency of a power transformer at relatively light loads is quite low. This is due to

(1) Small copper losses

(2) Small secondary output

(3) High fixed loss in comparison to the output

(4) Poor power factor

$\eta = \frac{O/P}{O/P + loss}$

3 25. A 2 KVA transformer has iron loss of 150W and full-load copper loss of 250W. The maximum efficiency of the transformer would occur when the total loss is

(1) 500 W (2) 400 W (3) 300 W (4) 100 W

3 26. In an auto transformer, power is transferred, through

(1) Conduction process only

(2) Induction process only

(3) Both Conduction and Induction processes

(4) Mutual coupling

3 27. In an electromechanical energy conversion devices, the developed torque depends upon

(1) Stator field strength and torque angle

(2) Rotor field and stator field strengths

(3) Stator field and rotor field strengths and torque angle

(4) Stator field strength only

28. Wave winding is employed in a dc machine for

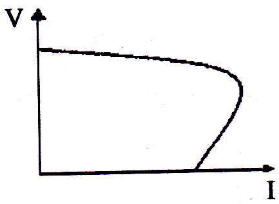
2

(1) High current and low voltage rating (2) Low current and high voltage rating

(3) High current and high voltage rating (4) Low current and low voltage rating

29. The slight curvature at the lower end of the OCC of a self-excited dc generator is due to
2
(1) Magnetic inertia
(2) Residual flux
(3) High speed
(4) High field resistance

30. The graph represents which of the following characteristics of dc shunt generator
2



(1) Internal characteristics
(2) External characteristics
(3) Open circuit characteristics
(4) Magnetic characteristics

31. A smaller air gap in a poly phase induction motor helps to
4
(1) Reduce the chance of crawling
(2) Increase the starting torque
(3) Reduce the chance of cogging
(4) Reduce the magnetizing current

32. The rotor of a 3-phase induction motor rotates in the same direction as that of stator rotating field. This can be explained by
2
(1) Faraday's law of electromagnetic induction
(2) Lenz's law
(3) Newton's law
(4) Fleming's right hand rule

33. In a three phase slip ring induction motor high starting-torque is achieved by
4
(1) Increase supply voltage
(2) Increase supply frequency
(3) Connecting a capacitor across the motor terminals
(4) Connecting a star-connected resistance across the slip ring terminals of the motor

34. Two windings provided on the stator of a single phase induction motor, one main winding and the other auxiliary winding are connected
    (1) In parallel
    (2) In series
    (3) Either in series or parallel depending on the design of the motor
    (4) Through inductive coupling

35. A synchronous machine connected to power system grid bus-bar is operating as a generator. To make the machine operate as motor, the
    (1) Direction of rotation is to be reversed
    (2) Phase-sequence is to be changed
    (3) Field excitation is to be decreased
    (4) Field excitation is to be increased

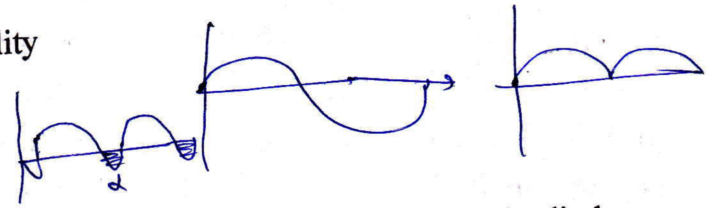
36. In a synchronous generator with constant steam input supplies power to an infinite bus at a lagging power factor. If the excitation is increased
    (1) Both power angle and power factor decrease
    (2) Both power angle and power factor increase
    (3) Power angle decreases while power factor increases
    (4) Power angle increases while power factor decreases

37. A 10 pole, 25Hz alternator is directly coupled to and is driven by 60 Hz synchronous motor. What is the number of poles for the synchronous motor?
    (1) 48
    (2) 12
    (3) 24
    (4) 16

38. Which one among the following has the highest numerical value in a stepper motor?
    (1) Detent torque
    (2) Holding torque
    (3) Dynamic torque
    (4) Ripple torque

39. Which of the following types of motors are most suitable for a computer printer drive
    (1) Reluctance motor
    (2) Hysteresis motor
    (3) Shaded pole motor
    (4) Stepper motor

40. The main advantage of IGBT over SCR in power electronics
    (1) Reduced weight
    (2) Self-commutating capability
    (3) Very high reliability
    (4) Self-cooling property

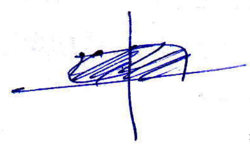


41. In a 2-pulse bridge converter with free-wheeling diode, the width of the diode current pulse over one cycle is (α is firing angle)
    (1) $\pi + \alpha$ (2) $\pi - \alpha$ (3) π (4) 2α

42. A 440V, 3-phase, 10 pole and 50 Hz synchronous motor delivering a torque of $\frac{50}{\pi} N-m$, delivers a power of:
    (1) 50W (2) 500W (3) 1000W (4) 2000W

43. A PWM switching scheme is used with a three phase inverter to
    (1) Reduce total harmonic distortion with modest filtering
    (2) Minimize the load on the dc side
    (3) Increase the life of batteries
    (4) Reduce the low order harmonics and increase the high order harmonics

44. Which of the following configurations is used for both motoring and regenerative braking
    (1) First quadrant chopper
    (2) Second quadrant chopper
    (3) Two quadrant chopper
    (4) Four quadrant chopper



45. The synchronous reactance is the
    (1) Reactance due to armature reaction of the machine
    (2) Reactance due to leakage flux
    (3) Combined reactance due to leakage flux and armature reaction
    (4) Reactance either due to armature reaction or leakage flux

(P.T.O.)

1 46. The results of a slip test for determining direct-axis (X_d) and quadrature-axis (X_q) reactances of a star connected salient pole alternator are given below :

Phase values : $V_{max} = 108$ V; $V_{min} = 96$ V;
$I_{max} = 12$A; $I_{min} = 10$ A;

Hence the two reactances will be

(1) $X_d = 10.8\Omega$ and $X_q = 8\Omega$
(2) $X_d = 9\Omega$ and $X_q = 9.6\Omega$
(3) $X_d = 9.6\Omega$ and $X_q = 9\Omega$
(4) $X_d = 8\Omega$ and $X_q = 10.8\Omega$

2 47. The most economical power factor with rate per maximum demand per annum is Rs.20 and the expenditure per kVA per annum is Rs.3.8, will be :

(1) 0.19 lag or lead
(2) 0.9 lag or lead
(3) 0.9 lag
(4) 0.9 lead

3 48. Gas turbine is widely used in

(1) Automotive
(2) Electric locomotives
(3) Aircrafts
(4) Pumping stations

1 49. Large size nuclear plants are suitable for

(1) Base loads
(2) Peak loads
(3) Inter mediate loads
(4) Average loads

50. The characteristic impedance of a line in ohms, with series impedance of 0.1 ohms per unit length and shunt admittance of 0.001 mhos per unit length is given by :

4 ×

(1) 0.0001
(2) 0.01
(3) 100
(4) 10

0.001×0.1
$\sqrt{10^{-4}} = 10^{-2} = 0.01$

51. A transmission line has 3% of resistance and 5% of inductive reactance. Its percentage regulation at full load and 0.8 P.F lead is

3

(1) 8
(2) 5.4
(3) −0.6
(4) −2

$3(0.8) - 5(0.6)$
2.4
3.0
0.6

52. A single phase short transmission line has an impedance of j0.6 ohms, supplies a resistive load of 500A at 400V. The sending end p.f. will be :

2

(1) Unity (2) 0.8 lagging

(3) 0.8 leading (4) 0.6 lagging

j0.6 0.8 $\frac{4}{5}$

53. The transmission network of short transmission line will have the transmission parameters as :

1

(1) 1, Z, 0, 1 (2) 0, 1, 1, Z

(3) Z, 0, 1, 1 (4) 1, 1, Z, 0

54. The electrical power transmission network will be

3

(1) Symmetrical but not reciprocal (2) Reciprocal but not symmetrical

(3) Both symmetrical and reciprocal (4) Neither symmetrical nor reciprocal

55. In a three core cable, the capacitance between two conductors (with sheath earthed) is 1 microfarad. The capacitance per phase in microfarads will be :

4

(1) 0.33 (2) 3 (3) 0.5 (4) 2

56. Shunt capacitors are used in distribution lines

1

(1) To provide reactive power compensation

(2) To reduce line losses

(3) To reduce voltage drop

(4) To reduce sending end voltage

57. In a three unit insulator string, the voltage across lowest string is 10KV, and string efficiency is 90%, then the total string voltage will be:

2

(1) 3 KV (2) 27 KV

(3) 30 KV (4) 9 KV

$0.9 = \frac{V}{3\times 10}$

27

58. Whenever the conductors are dead-ended or there is a change of directions of transmission line, the insulators used are :

4

(1) Shackle type (2) Suspension type

(3) Pin type (4) Strain type

59. Corona loss will increase with
   (1) Increase in conductor size and decrease in supply frequency
   (2) Decrease in conductor size and decrease in supply frequency
   (3) Decrease in conductor size and increase in supply frequency
   (4) Increase in conductor size and increase in supply frequency

60. The charging reactance of 10 km. line is 500 ohms. If the line length is doubled, the chargin
reactance in ohms will be
   (1) 1000
   (2) 500
   (3) 2000
   (4) 250

61. The inductance of a transmission line is minimum when
   (1) Both GMD and GMR is high
   (2) GMD is low and GMR is high
   (3) GMD is low and GMR is low
   (4) GMD is high and GMR is low

$L = 2\times10^{-7} \ln\left(\frac{GMD}{GMR}\right)$

62. The value of a transmission line impedance is 5 pu with 10MVA, 10KV base values. Its impedanc
value in Ohms is
   (1) 1
   (2) 0.5
   (3) 5
   (4) 10

$5 \times \frac{10\times10}{10} =$

63. The off-diagonal element Y_{ij} of a bus admittance matrix is equal to :
   (1) Same as the admittance of the element connected between buses i and j
   (2) Minus of the admittance of the element connected at buses i and j
   (3) Minus of the admittance of the element connected between buses i and j
   (4) Same as diagonal element

64. The number of iterations will be least in the following methods to obtain load flow solution
   (1) Gauss
   (2) Gauss-Siedel
   (3) Fast Decoupled
   (4) Newton-Raphson

Booklet Code : **B**

65. In SLG fault, in conventional phases,

1 (1) The sequence components of currents are equal

(2) Positive and negative sequence components of currents are equal and zero sequence component of current is zero

(3) All sequence networks will be in parallel

(4) Zero sequence component only will be present.

66. The ranking and severity of the fault can be written in ascending order as :

2 (1) LLG, LL, SLG, LLLG (2) SLG, LL, LLG, LLLG

(3) LL, LLG, LLLG, SLG (4) LLLG, LLG, LL, SLG

67. If the inertia constant is 4MJ/MVA and rating of the generator is 10MVA, then the energy is :

1 (1) 40MJ (2) 4MJ

(3) 2.5MJ (4) 0.4MJ

68. The critical clearing time of a fault in a power system is related to

3 (1) Steady state stability limit (2) Short circuit current limit

(3) Transient stability limit (4) Reactive power limit

x 69. In an IDMT relay, electromagnetic over current relay, the minimum time is achieved because of

4 (1) Electromagnetic damping

(2) Proper mechanical design

(3) Appropriate time delay element

(4) Saturation of the magnetic circuit

70. The relay used for phase fault protection of short transmission line is :

1 (1) Impedance relay (2) Reactance relay

(3) Mho relay (4) Admittance relay

4 71. When voltage is high and current is low, the Circuit Breaker (CB) preferred is :

(1) Oil CB (2) Air blast CB

(3) Air break CB (4) Vacuum CB

72. In the power system stability,

3

(1) Steady state stability is equal to transient stability limit

(2) Steady state stability limit is less than transient stability limit

(3) Steady state stability limit is greater than transient stability limit

(4) Transient stability limit with governor control mechanism will be more than steady sta
stability limit.

73. The line currents of a three phase system are: j3 A, (1 + j1) A, (– 1 – j1) A. The zero sequen
current will be :

1

(1) j1 A
(2) j3 A
(3) j9 A
(4) 0 A

$\begin{pmatrix} I_{a0} \\ I_{a1} \\ I_{a2} \end{pmatrix} = \frac{1}{3}\begin{pmatrix} \end{pmatrix}\begin{pmatrix} I_a \\ I_b \\ I_c \end{pmatrix}$

j3/3

j3
1+j1
−1−j1

74. In hydroelectric plants

4

(1) Operating cost is high and capital cost is high

(2) Operating cost is high and capital cost is low

(3) Operating cost is low and capital cost is low

(4) Operating cost is low and capital cost is high

75. Equal area criterias is applied to calculate

4

(1) Steady state stability power limit

(2) Transient stability current limit

(3) Critical clearing voltage angle for transient faults

(4) Critical clearing torque angle and time for transient faults.

76. Zero sequence current is used for relaying purposes only in the case of

1

(1) Ground over current relay

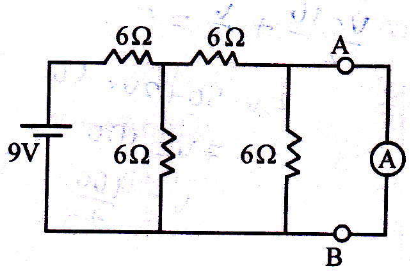
(2) Phase over current relay

(3) Phase impedance relay

(4) Ground impedance relay

77. An ideal ammeter is connected between terminals A and B. The reading of the ammeter is

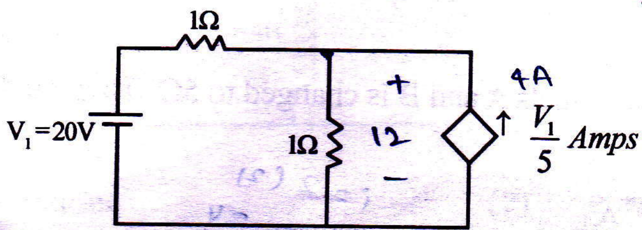
3



(1) 0.8A (2) 1A (3) 0.5A (4) 0.6A

78. In the circuit shown, the dependent source

2



$\frac{V-20}{1} + \frac{V}{1} = 4$

$2V = 24$

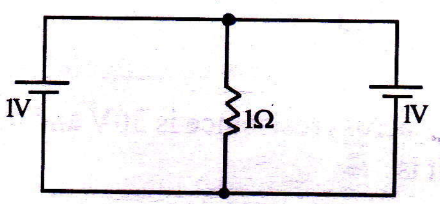
$V = 12$

(1) Delivers 24W (2) Delivers 48W

(3) Absorbs 48W (4) Absorbs 24W

79. The current in the 1 ohm resistor in the circuit is

4



(1) Zero (2) 0.5A (3) 2A (4) 1A

80. In an A.C. circuit, the Thevenin's voltage is $10\angle 30°$ Volts and Norton's current is $2\angle 60°$ Amps between load terminals. The value of load impedance to have maximum power transfer to the load is

1

(1) $5\angle 30°\Omega$ (2) $5\angle -30°\Omega$

(3) $20\angle 90°\Omega$ (4) $20\angle -90°\Omega$

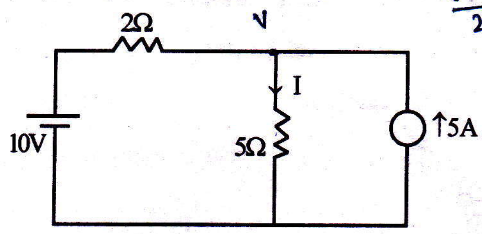
$Z_{th} = 5\angle -30$

$Z_L = Z_{th}^*$

$= 5\angle 30$

3

81. The current I in the circuit is



$\frac{V-10}{2} + \frac{V}{5} = 5$

$5V-50+2V=50$

$7V=100$

$V=\frac{100}{7}$

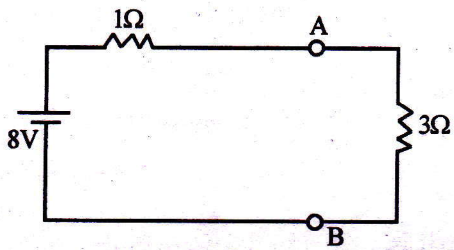
$i = \frac{\cancel{100}^{20}}{7\times5}$

(1) $\frac{10}{7}A$ (2) Zero

(3) $\frac{20}{7}A$ (4) $\frac{30}{7}A$

1

82. The value of resistance between terminals A and B is changed to 5Ω. Then the Compensati[ng] Voltage is



$i=2(2)$

$=4$

$i=\cancel{8/8}$

$\Delta V=$

(1) 4V (2) 2V

(3) 8V (4) 6V

2

83. In a given series R-L circuit, the voltage across resistance is 30V and across inductance is 40V. Then the total voltage across the circuit is

(1) 70V (2) 50V

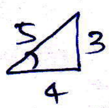
(3) 10V (4) 30V

4

84. The Impedance of the circuit is (4 + j3) ohms. The Power factor of the circuit is

(1) 0.6 lead (2) 0.8 lead

(3) 0.6 lag (4) 0.8 lag



$\cos\theta = 4/5$

$= 0.8$

Booklet Code : **B**

85. In a two element series circuit, the applied voltage is $v(t) = 100 \sin \omega t$ and the current flowing is $i(t) = 10 \sin (\omega t - 45°)$. Then the values of Resistance and Reactance of the circuit are

1

(1) $R = 7.07\Omega$ $X = j7.07\Omega$

(2) $R = 5\Omega$ $X = j8.66\Omega$

(3) $R = 7.07\Omega$ $X = -j7.07\Omega$

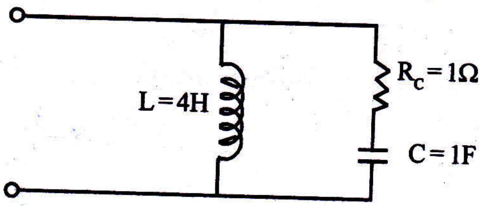
(4) $R = 5\Omega$ $X = -j8.66\Omega$

$\left(\frac{10}{\sqrt{2}}\right)^2 + \left(\frac{10}{\sqrt{2}}\right)^2$

100

86. The angular frequency of resonance of the circuit is

2



$\frac{4s(1+\frac{1}{s})}{4s+1+\frac{1}{s}} = \frac{4s(s+1)}{4s^2+s+1}$

$\frac{4s(s+1)(1+4s^2-s)}{(4s^2+4s)(1-s+4s^2)}$

$-4s^3+4s+16s^3=0$

$\cancel{12}s^3 = 4$ $s = 1/\sqrt{3}$

(1) $\frac{1}{\sqrt{2}}$ rad/sec

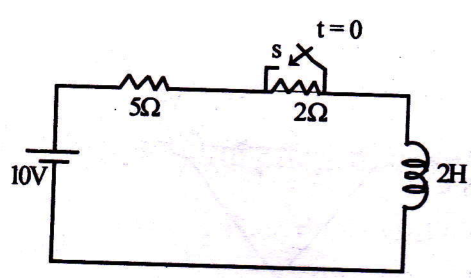
(2) $\frac{1}{\sqrt{3}}$ rad/sec

(3) $\frac{1}{\sqrt{5}}$ rad/sec

(4) $\frac{1}{\sqrt{6}}$ rad/sec

87. In the series R-L circuit, the switch is closed at $t = 0$. The value of current at $t = 0$ is

3



(1) Zero

(2) 2A

(3) $\frac{10}{7}A$

(4) 5A

88. A series R-C circuit has a time constant of 0.1 sec. and its value of C is 2 micro farads. The value of R is

1

(1) $0.05M\Omega$

(2) 0.05Ω

(3) $0.1M\Omega$

(4) 0.01Ω

$0.1 = R(2M)$

0.05

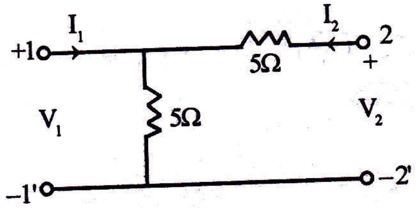
$\frac{0.1 \times 10^6}{2} = \frac{10^5}{2} =$

(P.T.O.)

89. The value of the parameter A for the two port network shown is

4

$\begin{pmatrix} V_1 \\ I_1 \end{pmatrix} = \begin{pmatrix} A & B \\ C & D \end{pmatrix} \begin{pmatrix} V_2 \\ I_2 \end{pmatrix}$



$V_1 = 5I_1 + 5I_2$

$V_2 = 5I_1 + 10I_2$

(1) Zero
(2) 0.5
(3) 2
(4) 1

90. The poles and zeros of driving point impedance function are simple and interlace on the negat real axis with a pole closest to the origin. It can be realised

3

(1) as an LC driving point impedance
(2) as RL driving point impedance
(3) as RC driving point impedance
(4) as RLC driving point impedance

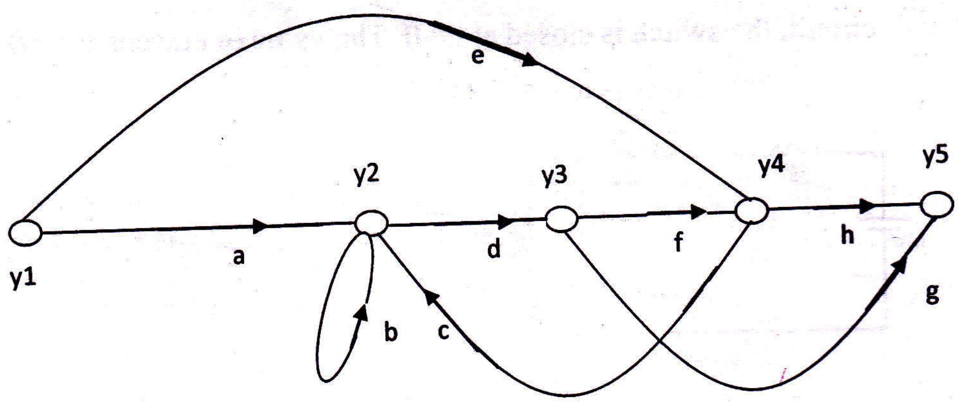
$Z_{LC} = \frac{k_0}{s} + \sum \frac{k_i s}{s^2+\omega^2} + k_\infty s$

$Z_{RC} = \frac{k_0}{s} + \sum \frac{k}{s+\sigma} + k_1$

$Z_{RL} = k_0 + \sum \quad + k_1 s$

91. The number of forward paths in the following signal flow-graph is

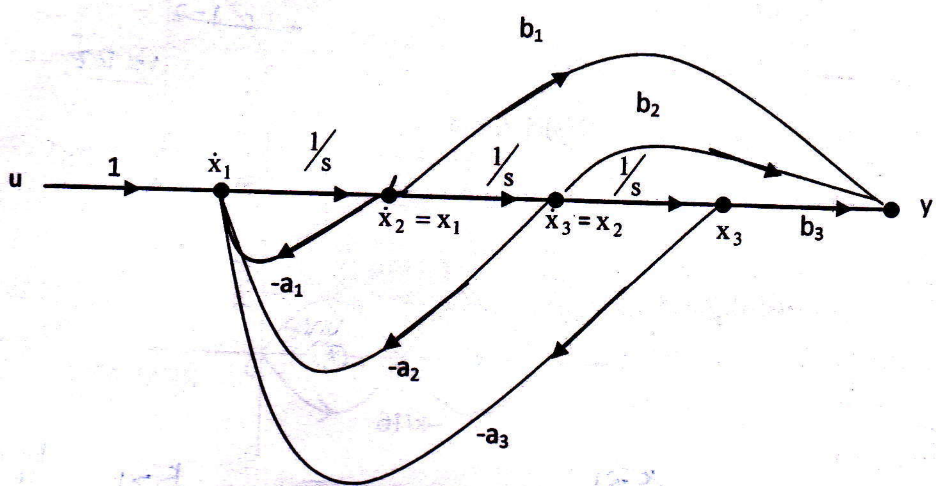
4



(1) 3
(2) 2
(3) 5
(4) 4

92. Let $\dfrac{y(s)}{u(s)}=\dfrac{b_1s^2+b_2s+b_3}{s^3+a_1s^2+a_2s+a_3}$ is represented by a signal flow graph as shown below, the state vector is $[x_1, x_2, x_3]^T$ where T indicates transpose of the vector. Then the system matrix A of state model is

3 ✗



(1) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -a_3 & -a_2 & -a_1 \end{bmatrix}$ (2) $\begin{bmatrix} -a_1 & 1 & 0 \\ -a_2 & 0 & 1 \\ -a_3 & 0 & 0 \end{bmatrix}$

(3) $\begin{bmatrix} -a_1 & -a_2 & -a_3 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ (4) $\begin{bmatrix} 0 & 0 & -a_3 \\ 1 & 0 & -a_2 \\ 0 & 1 & -a_1 \end{bmatrix}$

93. The open-loop transfer function of a unity feedback (negative feed-back) system is $G(s)=\dfrac{K}{s(s+2)(s^2+2s+2)}$. Then the closed loop transfer function for k=1 is

2

(1) $\dfrac{1}{(s+1)^3}$ $\dfrac{\frac{1}{s(s+2)(s^2+2s+2)}}{1+\frac{1}{s(s+2)(s^2+2s+2)}}$ (2) $\dfrac{1}{(s+1)^4}$ $\dfrac{1}{s(s+2)(s^2+2s+2)+1}$

$(s^2+2s)(s^2+2s+2)+1$

(3) $\dfrac{1}{(s+1)^2(s^2+2s+1)}$ (4) $\dfrac{1}{(s^2+2s+1)^2}$ $s^4+2s^3+2s^2+2s^3+4s^2+4s+1$

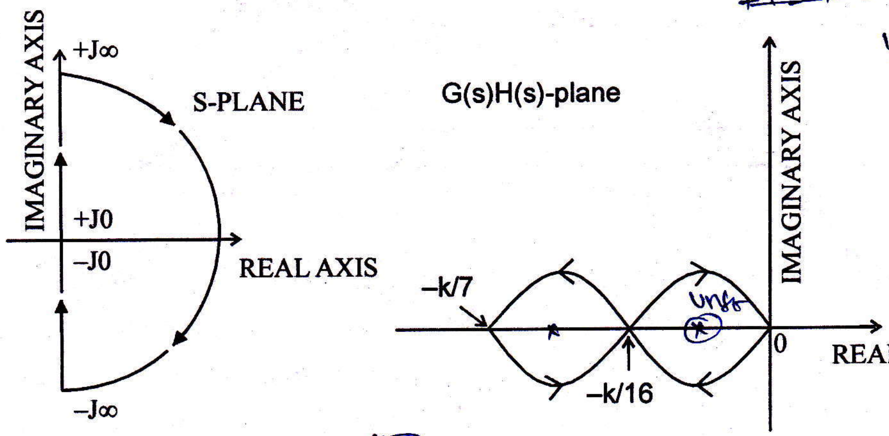
$s^4+4s^3+6s^2+4s+1$

94. The open-loop transfer function of a unity feedback (negative feedback) system $G(s)=\frac{k}{(s-1)(s^2+4s+7)}$. The Nyquist Contour is in s-plane. For $k>0$ the Nyquist plot is shown in G(s)H(s) plane. The system is stable for

$N = P - Z$

$+1 = 1 - Z$

$1 = 1 - Z$

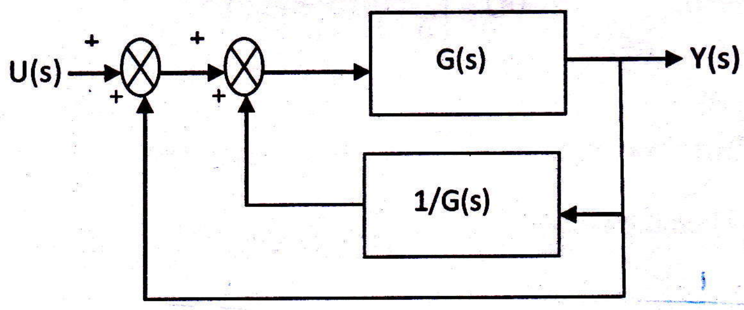


$\frac{k}{7} > 1$ $\quad \frac{k}{16} < 1$

(1) $7 < k < 16$ (2) $0 < k < 16$

(3) $0 < k < 7$ (4) $k > 0$

95. The overall transfer function of the following system is



$\frac{G(s)}{1-(1+G(s))}$

$= \frac{G(s)}{1 - G(s)\cdot\frac{1}{G(s)}}$

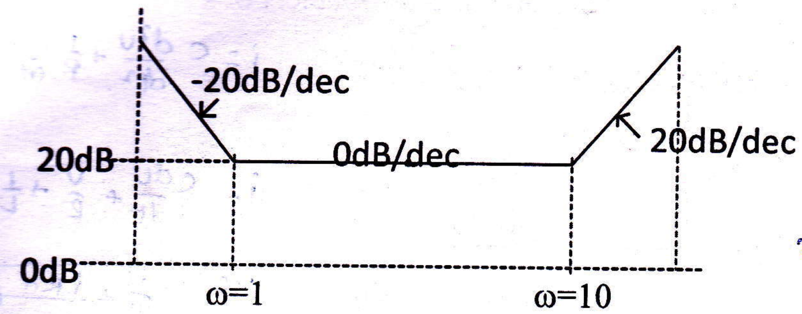
(1) –1 (2) Indeterminate

(3) 1 (4) Infinity

$\frac{G}{1+GH}$

96. The magnitude Bode plot of a minimum-phase transfer function G(s)H(s) is as shown below. The Transfer function G(s)H(s) is

2



20 = −20 log 1 + K 20 log K

K = 10

(1) $\frac{10(s+1)(s+10)}{s}$ $\quad \frac{K(1+s/1)(1+s/10)}{s}$ (2) $\frac{(s+1)(s+10)}{s}$

(3) $\frac{s(s+10)}{(s+1)}$ (4) $\frac{10s(s+10)}{(s+1)}$

97. When the closed-loop system is subjected to a step input of magnitude 2, the system response is given by 24 2 6 144

3

$y(t) = 2 + 0.4e^{-60t} - 2.4e^{-10t}$. The closed loop-transfer function of this system is

(1) $\frac{1200}{(s+10)(s+60)}$ $\quad \frac{2}{s} + \frac{0.4}{s+60} - \frac{2.4}{s+10}$ (2) $\frac{1200}{s(s+10)(s+60)}$ $\quad 2(s^2+70s+600)$ $\quad 0.4s^2 + 4s$

(3) $\frac{600}{(s+10)(s+60)}$ $\quad \frac{2(s+60)(s+10) + 0.4(s)(s+10) - 2.4s(s+60)}{s(s+60)(s+10)}$ (4) $\frac{1200}{(s-10)(s+60)}$ $\quad -2.4s^2 - 144s$

$2s^2 + 140s + 1200 + 0.4s^2 + 4s - 2.4s^2 - 144s$

$\frac{1200}{s(s+60)}$ 2 × 600

98. The open-loop transfer function of a unity feedback(Positive feedback) system is $G(s) = K/(s^2+1)^2$. The system stability according to Routh is

4

(1) Unstable for K>0

(2) Stable for 0 < K < 1 $\quad (s^2+1)^2 + K$

(3) Stable for K>0 $\quad s^4 + 2s^2 + 1 + K$

(4) Marginally stable for 0<K<1 $\quad 4s^3 + 4s$

s^4	1	2	1+K
s^3	4	4	–
s^2	1	1+K	–
s^1	−4K	–	
s^0	1+K		

$(s^2+1)^2 - K$ $\quad 4+4K$

$s^4 + 2s^2 + (1-K)$

$\frac{4-(4+4K)}{1} =$

$s^3 + s = 0$

$s(s^2+1) = 0$

$s = 0 \quad s^2 = 1$

$\pm j$

$4 - 4K$

$1 - K > 0$

$K < 1$

 (P.T.O.)

99. The mathematical model of an analogous electrical system for the following mechanical system using force-current analogy is (i –current, v- voltage, L – Inductance, C –Capacitance)

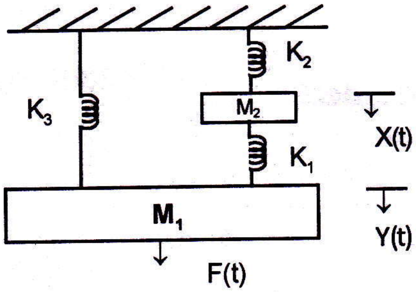
4

$F = m_1\frac{d^2x}{dt^2} + k_3 + k_1(y-x)$

$i = C\frac{d^2v}{dt^2} + \frac{1}{R}\frac{dv}{dt} + \frac{1}{L}v$

$i = C\frac{dv}{dt} + \frac{v}{R} + \frac{1}{L}\int v\,dt$

$v = L\frac{di}{dt} + iR + \frac{1}{C}\int i\,dt$



(1) $\frac{1}{C_{K1}}\int(i_y - i_x)\,dt = L_{M2}\frac{di_x}{dt} + \frac{1}{C_{K2}}\int i_x\,dt,\ v_F(t) = L_{M1}\frac{di_y}{dt} + \frac{1}{C_{K3}}\int i_y\,dt + \frac{1}{C_{K1}}\int(i_y - i_x)\,dt$

(2) $\frac{1}{L_{K1}}\int(i_y - i_x)\,dt = C_{M2}\frac{di_x}{dt} + \frac{1}{L_{K2}}\int i_x\,dt,\ v_F(t) = C_{M1}\frac{di_y}{dt} + \frac{1}{L_{K3}}\int i_y\,dt + \frac{1}{L_{K1}}\int(i_y - i_x)\,dt$

(3) $\frac{1}{C_{K1}}\int(v_y - v_x)\,dt = L_{M2}\frac{dv_x}{dt} + \frac{1}{C_{K2}}\int v_x\,dt,\ i_F(t) = L_{M1}\frac{dv_y}{dt} + \frac{1}{C_{K3}}\int v_y\,dt + \frac{1}{C_{K1}}\int(v_y - v_x)\,dt$

✓(4) $\frac{1}{L_{K1}}\int(v_y - v_x)\,dt = C_{M2}\frac{dv_x}{dt} + \frac{1}{L_{K2}}\int v_x\,dt,\ i_F(t) = C_{M1}\frac{dv_y}{dt} + \frac{1}{L_{K3}}\int v_y\,dt + \frac{1}{L_{K1}}\int(v_y - v_x)\,dt$

100. If the closed – loop transfer function T(s) of a unity negative feedback system is given by:

3

$T(S) = \frac{a_{n-1}S + a_n}{S^n + n_1S^{n-1} + \ldots\ldots + a_{n-1}S + a_n}$ then the steady state error for a unit ramp input is

(1) $\frac{a_n}{a_{n-1}}$

(2) infinity

$\frac{G}{1+G} = \frac{a_{n-1}S + a_n}{a_n + a_{n-1}S + a_{n-2}S^2 + \ldots}$

$G(s) = \frac{S}{S^x}$

✓(3) zero

(4) $\frac{a_n}{a_{n-2}}$

$a_n + a_{n-1}S + a_{n-2}S^2 + \ldots)G$

$= (a_{n-1}S + a_n) + G(a_{n-1}S \ldots$

$\lim_{s\to 0} G(s) = \frac{a_n + a_{n-1}S}{S^2(a_{n-2} + a_{n-3}S + \ldots)}$

=

✻ ✻ ✻ ✻ ✻