HPPSC

Previous Year Paper
AE EE 2016 Paper 2

Booklet Serial No. : 325

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TEST BOOKLET SERIES

TEST BOOKLET

A.E.(Elect.)HPPTCL-2016

A

Time Allowed : 2 Hours] [Maximum Marks : 100

All questions carry equal marks.

INSTRUCTIONS

1. Immediately after the commencement of the examination, you should check that test booklet does not have any unprinted or torn or missing pages or items, etc. If so, get it replaced by a complete test booklet.
2. **Encode clearly the test booklet series A, B, C or D as the case may be in the appropriate place in the answer-sheet.**
3. Write your Roll Number only in the box provided alongside. Do not write anything else on the Test Booklet.
4. This Test Booklet contains **100** items (questions). Each item comprises four responses (answers). Choose only one response for each item which you consider the best.
5. After the candidate has read each item in the Test Booklet and decided which of the given responses is correct or the best, he has to mark the circle containing the letter of the selected response by blackening it completely with Black or Blue ball pen. In the following example, response "C" is so marked :

6. Do the encoding carefully as given in the illustrations. While encoding your particulars or marking the answers on answer sheet, you should blacken the circle corresponding to the choice in full and no part of the circle should be left unfilled. After the response has been marked in the ANSWER SHEET, no erasing/fluid is allowed.
7. You have to mark all your responses ONLY on the ANSWER SHEET separately given according to 'INSTRUCTIONS FOR CANDIDATES' already supplied to you. *Responses marked on the Test Booklet or in any paper other than the answer sheet shall not be examined.*
8. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. There will be no negative marking.
9. Before you proceed to mark responses in the Answer Sheet fill in the particulars in the front portion of the Answer Sheet as per the instructions sent to you.
10. If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct.
11. After you have completed the test, hand over the Answer Sheet only, to the Invigilator.

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P.T.O.

Time Allowed : 2 Hours] [Maximum Marks : 100

1. A scalar field is harmonic in a given region, if its Laplacian is ..... .

(A) ∞ (B) -1

(C) 1 (D) 0

2. Stokes' Theorem relates, ... integral to a .....integral.

(A) volume, surface (B) volume, line

(C) line, surface (D) any of these

3. Magnetic vector potential for volume current is expressed as ..... .

(A) $\int_S \frac{\mu_0 J dv}{4\pi r}$ (B) $\int_S \frac{\mu_0 J dv}{4\pi r^2}$

(C) $\int_S \frac{\mu_0 J dv}{2\pi r}$ (D) $\int_S \frac{\mu_0 J dv}{2\pi r^2}$

4. According to the Law of Refraction, ...

(A) $\tan\theta_1 = \frac{\mu_2}{\mu_1}\tan\theta_2$ (B) $\tan\theta_1 = \frac{\tan\theta_2}{\mu_1\mu_2}$

(C) $\tan\theta_1 = \frac{\mu_1\mu_2}{\tan\theta_2}$ (D) $\tan\theta_1 = \frac{\mu_1}{\mu_2}\tan\theta_2$

5. Dot multiplication $\hat{a}_y.\hat{a}_\phi$ is equal to ..... .

(A) $\sin\phi$ (B) $\cos\phi$

(C) $-\sin\phi$ (D) $-\cos\phi$

6. Poisson's equation is given by ..... .

(A) $\nabla^2 V = -\frac{\rho_v}{\varepsilon_o}$

(B) $\nabla^2 V = \frac{\rho_v}{\varepsilon_o}$

(C) $\nabla^2 V = -\rho_v \varepsilon_o$

(D) $\nabla^2 V = \rho_v \varepsilon_o$

7. Brewster's angle is given as $\tan \theta_B =$ ..... .

(A) $\sqrt{\frac{\varepsilon_1}{\varepsilon_2}}$

(B) $\sqrt{\frac{\varepsilon_2}{\varepsilon_1}}$

(C) $\sqrt{\varepsilon_1 \varepsilon_2}$

(D) $\frac{1}{\sqrt{\varepsilon_1 \varepsilon_2}}$

8. A family of arcs is obtained in the Smith chart by varying normalized reactance in the range of ..... .

(A) -1 to 0

(B) 0 to 1

(C) 0 to ∞

(D) $-\infty$ to ∞

9. Conductance per unit length of a coaxial transmission line is given by ..... .

(A) $\frac{2\pi\sigma}{\ln\left(\frac{b}{a}\right)}$

(B) $\frac{2\pi\varepsilon}{\ln\left(\frac{b}{a}\right)}$

(C) $\frac{\ln\left(\frac{b}{a}\right)}{2\pi\sigma}$

(D) $\frac{\ln\left(\frac{b}{a}\right)}{2\pi\varepsilon}$

10. In the lattice network shown in Figure-1, the value of R (in Ohms) for the maximum power transfer to the load will be :

(A) 5 (B) 6.5

(C) 8 (D) 9

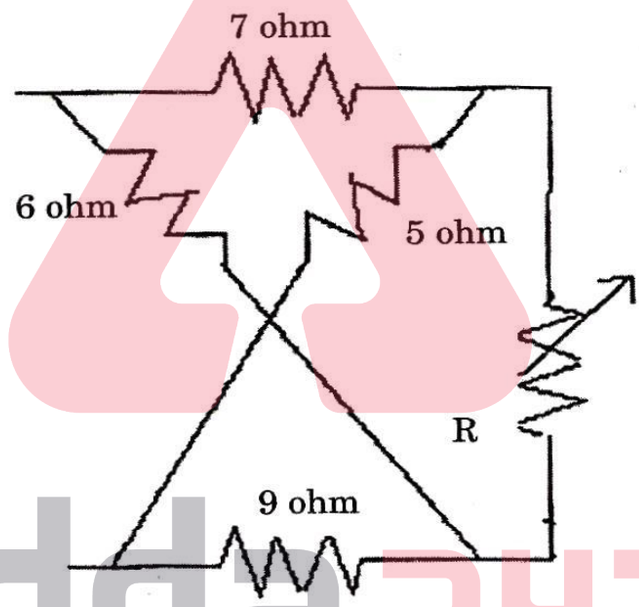

Figure-1

11. A two-port network is defined by the relations :

$$I_1 = 2V_1 + V_2 \text{ and } I_2 = 2V_1 + 3V_2.$$

Then Z_{12} (in Ohms) is :

(A) -2 (B) -1

(C) $-\frac{1}{2}$ (D) $-\frac{1}{4}$

12. The voltage ratio transfer function of an active filter is given by :

$$\frac{V_1(s)}{V_2(s)} = \frac{s^2 + c}{s^2 + as + b}$$

The above transfer function is for a :

(A) Low pass filter

(B) High pass filter

(C) Band pass filter

(D) Band reject filter

13. An RLC resonant circuit has a resonance frequency of 1.5 MHz and a bandwidth of 10 kHz. If C = 150 pF, then the effective resistance (in Ohms) of the circuit will be :

(A) 29.5

(B) 14.75

(C) 9.4

(D) 4.7

14. An initially relaxed RC series circuit network with R = 2 M-Ohm and C = 1 μF is switched on to a 10 V step input. The voltage across the capacitor after 2 seconds will be :

(A) Zero

(B) 3.68 V

(C) 6.32 V

(D) 10 V

15. The value of boost factor is equal to unity when TCSC (Thyristor Controlled Series Capacitor) is operated in :

(A) Capacitive boost mode

(B) Inductive boost mode

(C) Blocking mode

(D) Bypass mode

16. The characteristics equation for a third order system is :

$$s^3 + 2s^2 + 4s + k = 0$$

For a system to be stable, what should be the value of gain k ?

(A) $2 < k < 8$ (B) $0 < k < 2$

(C) $0 < k < 8$ (D) $0 < k < 4$

17. If the penalty factor of bus 1 in a two-bus system is 1.25 and if the incremental cost of production at bus 1 is Rs. 20 per MW-hr, the cost of received power at bus 2 is :

(A) Rs. 250 per MW-hr (B) Rs. 160 per MW-hr

(C) Rs. 62.5 per MW-hr (D) Rs. 25 per MW-hr

18. According to the fuse law, the current carrying capacity is directly proportional to :

(A) diameter (B) $(\text{diameter})^{1.5}$

(C) $(\text{diameter})^{0.5}$ (D) $\frac{1}{\text{diameter}}$

19. An over-current relay, having a current setting of 12.5% is connected to a supply circuit through a current transformer of ratio 400/5. The pick-up value of the current in Amperes is :

(A) 6.25 (B) 10

(C) 12.5 (D) 15

20. The cirtical clearing time of a fault power systems is related to :

(A) reactive power limit

(B) short-circuit limit

(C) steady-state stability limit

(D) transient stability limit

21. For a 15-bus power system network with 3 voltage-controlled buses, the size of Jacobian matrix of Newton-Raphson method used to solve a load flow problem is :

(A) 25 × 25 (B) 24 × 24

(C) 20 × 20 (D) 15 × 15

22. Signal flow graphs are primarily useful for analyzing :

(A) open loop control system

(B) feedback control systems

(C) non-linear control systems

(D) non-linear feedback control systems

23. A large time constant and small time constant of a system corresponds, respectively to :

(A) oscillatory system and stable system

(B) sluggish system and fast response system

(C) fast response system and sluggish system

(D) large output and minimum output

24. If there are repeated roots of the characteristic equation on the jω-axis, the system would be :

(A) conditionally stable

(B) oscillatory

(C) stable

(D) unstable

25. For a feedback system having the characteristic equation :

$$1 + \frac{K}{s(s+1)(s+2)} = 0$$

The angles of the straight line asymptotes of the root locus with the real axis, are given by :

(A) 30°, 90°, 180°

(B) 30°, 180°, 300°

(C) 60°, 180°, 300°

(D) 30°, 60°, 120°

26. The transfer function of a compensating network is given as :

$$G_c(s) = \frac{s+z}{s+p}$$

when $|z| < |p|$, the network is called the :

(A) phase-lag network

(B) phase-lead network

(C) phase-lag-lead network

(D) phase shifting network

27. Principle of duality, according to Kalman, can be used to establish analogies between controllability and :

(A) sensitivity

(B) responsiveness

(C) operability

(D) susceptibility

28. The initial slope of the Bode plot for a type 2 system intersects 0 dB axis at :

(A) $\omega = 0$

(B) $\omega = k$

(C) $\omega = \sqrt{k}$

(D) $\omega = k^2$

29. The expression given below is the impulse response of a feedback control system

$$c(t) = e^{-0.6t} \sin 0.8t.$$

The damping ratio and natural frequency of oscillations are respectively, given by :

(A) 0.6, 1 rad/sec

(B) 0.8, 0.6 rad/sec

(C) 1, 0.6 rad/sec

(D) 1, 0.8 rad/sec

30. A milliammeter of resistance 100 Ω is connected in series with a circuit. Its power consumption is 0.1 mW. Supposing it is replaced with a milliammeter of 200 Ω resistance the power consumed will be :

(A) 1 mW

(B) 0.2 mW

(C) 0.1 mW

(D) 0.05 mW

31. The power consumption in PMMC instruments is typically in the range of :

(A) 25 μW to 200 μW

(B) 0.25 mW to 2 mW

(C) 0.25 W to 2 W

(D) 2 W to 3 W

32. Which type of instrument has the highest frequency range with accuracy within reasonable limits ?

(A) Electrodynamometer

(B) Moving iron

(C) Rectifier

(D) Thermocouple

33. The power in an unbalanced 3-phase 4-wire circuit can be measured by using a ..... method.

(A) 4 wattmeter

(B) 3 wattmeter

(C) 2 wattmeter

(D) 1 wattmeter

34. Phantom loading for testing of energy meters is used :

(A) to isolate the current and potential circuits

(B) to reduce power loss during loading

(C) for meters having low current ratings

(D) to test meters having a large current rating

35. If an induction type energy meter runs fast, if can be slowed down by :

(A) lag adjustment

(B) light load adjustment

(C) adjusting the position of braking magnet and making it come closer to the centre of the disc

(D) adjusting the position of braking magnet and making it move away from the centre of the disc

36. Frequency can be measured by using :

(A) Wein's Bridge

(B) Schering Bridge

(C) Maxwell's Bridge

(D) Heaviside Campbell Bridge

37. A symmetrical square wave shape is applied to an average reading voltmeter with scale calibrated in terms of rms value of sinusoidal wave, has an error of :

(A) +11%
(B) +3.9%
(C) –3.9%
(D) –11%

38. A 0-10 A ammeter has a guaranteed accuracy of 1% of full scale deflection. The limiting error while reading 2.5 A would be :

(A) 6%
(B) 5%
(C) 4%
(D) 2%

39. A first order instrument has a time constant of 50 sec. It is subjected to a sinusoidal input cycling at 0.002 Hz. The time lag will now be :

(A) 500 sec
(B) 50 sec
(C) 44.6 sec
(D) 1 m-sec

40. FET is advantageous in comparison with BJT because of its :

(A) high input impedance
(B) high noise
(C) high gain bandwidth product
(D) current controlled behaviour

41. In a BJT, $I_{co} = I_{CBO} = 2\ \mu A$. For $\alpha = 0.99$ the value of I_{CEO} is given by :

(A) 200 μA

(B) 198 μA

(C) 99 μA

(D) 2 μA

42. Which family of logic circuits uses FETs ?

(A) CMOS

(B) TTL

(C) Both TTL and CMOS

(D) Neither TTL nor CMOS

43. In a transistor leakage current mainly depends on :

(A) doping of base

(B) size of emitter

(C) rating of transistor

(D) temperature

44. Common Mode Rejection Ratio for a differential amplifier is the ratio of :

(A) Differential gain and Common mode gain

(B) Differential gain and Integrated gain

(C) Integrated gain and Differential gain

(D) Common mode gain and Differential gain

45. An operational amplifier for analog computers should have :

(A) high drift and low power output

(B) high voltage output and low drift

(C) high power output and low output impedance

(D) high output impedance and low input impedance

46. For a Schmitt trigger, the upper and lower trip voltages are 3 V and 1 V, and high and low states are 15 V and 2 V. The output for a sinusoidal input of 10 V peak will lie between :

(A) 1 V and 3 V

(B) 2 V and 15 V

(C) 3 V and 15 V

(D) 10 V and 15 V

47. The resolution of a 12 bit D/A converter using a binary ladder with +10 V as the full scale output will be :

(A) 5.12 mV

(B) 4.32 mV

(C) 3.50 mV

(D) 2.44 mV

48. The Fourier transform of a unit step function is given by :

(A) $F(j\omega) = \frac{1}{j\omega}$

(B) $F(j\omega) = \frac{j}{\omega}$

(C) $F(j\omega) = j\omega$

(D) $F(j\omega) = -j\omega$

49. Which of the following interrupts has highest priority ?

(A) RST 7.5

(B) RST 6.5

(C) TRAP

(D) INTR

50. The expression

$$F = \bar{A}\,\bar{B} + \bar{A}\,B$$

can be simplified to :

(A) $F = A$ (B) $F = \bar{A}$

(C) $F = \bar{A}\,\bar{B}$ (D) $F = AB$

51. Interaction between a CPU and a Peripheral device that takes place during and I/O operation is known as :

(A) Handshaking (B) Flagging

(C) Relocating (D) Subroutine

52. What is the addressing mode used in instruction LDA 0345 H ?

(A) Direct (B) Indirect

(C) Indexed (D) Immediate

53. Which of the following circuits can be used as parallel to series converter ?

(A) Digital Counter (B) Decoder

(C) Multiplexer (D) De-multiplexer

54. A conductor is composed of seven identical copper strands each having a radius r, the self GMD of the conductor will be :

(A) r (B) $2r$

(C) $2.177r$ (D) $3.177r$

55. Which of the following insulators will be selected for high voltage applications ?

(A) Strain (B) Suspension

(C) Pin (D) Egg

56. The sag of a transmission line with 50 m span is 1 m. What will be the sag if the height of the transmission line is increased by 20% ?

(A) 2 m (B) 1.25 m

(C) 1.2 m (D) 1 m

57. A line which connects a distributor to substation is called :

(A) distributor (B) feeder

(C) line (D) service main

58. The skin effect does *not* depend on :

(A) nature of material (B) size of wire

(C) supply frequency (D) ambient temperature

59. Insulation resistance of a cable 20 km long is 1 MΩ. Two cable lengths, 20 km and 10 km are connected in parallel. The insulation resistance of the parallel combination is :

(A) 1.5 MΩ (B) 1 MΩ

(C) 0.66 MΩ (D) 0.5 MΩ

60. Which of the following faults occurs most frequently ?

(A) 3 phase fault (B) LLG fault

(C) LL fault (D) LG fault

61. The e.m.f. induced in the armature of a shunt generator is 600 V. The armature resistance is 0.1 Ohms. If the armature current is 200 A, the terminal voltage will be :

(A) 640 V (B) 620 V

(C) 600 V (D) 580 V

62. Ward-Leonard control is basically a :

(A) voltage control method

(B) field diverter method

(C) shunt armature control method

(D) armature resistance control method

63. For an SCR, $\frac{di}{dt}$ protection is achieved through the use of :

(A) R in series with SCR

(B) L across SCR

(C) RL in series with SCR

(D) L in series with SCR

64. The main reason for generation of harmonics in transformer could be :

(A) fluctuating load

(B) poor insulation

(C) mechanical vibrations

(D) saturation of core

65. A double squirrel cage induction motor has two :

(A) rotors moving in opposite direction

(B) parallel windings on rotor

(C) parallel windings on stator

(D) series windings in stator

66. If an induction motor with certain ratio of rotor to stator slots, runs at $\frac{1}{7}$ of the normal speed, the phenomenon will be treated as :

(A) humming

(B) hunting

(C) crawling

(D) cogging

67. An exciter is nothing but a :

(A) d.c. shunt motor (B) d.c. series motor

(C) d.c. shunt generator (D) d.c. series generator

68. An SCR can be brought of forward conducting state with gate circuit open when the applied voltage exceeds :

(A) the forward breakover voltage

(B) reverse breakdown voltage

(C) 1.5 V

(D) peak non-repetitive off-state voltage

69. Two alternators 1 and 2 are running in parallel. What will happen when the excitation of alternator 1 is increased ?

(A) Alternator 2 will burn out

(B) The wattless component will change

(C) Power output will reduce

(D) The machine will stop

70. An induction motor has a rotor resistance of 0.002 Ohm per phase. If the resistance is increased to 0.004 Ohm per phase, then the maximum torque :

(A) increases by 200% (B) increases by 100%

(C) remains unaltered (D) reduces to half

71. A d.c. series motor develops a torque of 20 Nm at 3 A of load current. If the current is increased to 6 A, the torque developed will be :

(A) 80 Nm (B) 40 Nm

(C) 20 Nm (D) 10 Nm

72. The most common insulation used in high voltage cable is :

(A) Rubber (B) VIR

(C) cloth (D) impregnated paper

73. In d.c. choppers, the wave forms for input and output voltages are, respectively :

(A) discontinuous, continuous (B) continuous, discontinuous

(C) both discontinuous (D) both continuous

74. A single phase one pulse diode rectifier is feeding an RL load with freewheeling diode across the load. For conduction angle β, the main diode and freewheeling diode would conduct, respectively, for :

(A) Π, Π-β (B) Π, β-Π

(C) β, Π (D) β–Π, Π

75. Communication overlap in the phase controlled ac to dc converters is due to :

(A) load inductance

(B) harmonic content of load current

(C) switching operation in the converter

(D) source inductance

76. The value of Townsends second ionization coefficient has :

(A) high value for low $\frac{E}{p}$ ratio

(B) low value for low $\frac{E}{p}$ ratio

(C) on relation with $\frac{E}{p}$ ratio

(D) on application if the gas pressure is low

77. In case of impulse thermal breakdown of insulating materials, the critical time to breakdown is :

(A) proportional to critical electric field

(B) inversely proportional to critical electric field

(C) proportional to square of critical absolute temperature

(D) None of the above

78. While testing transformer oil for dielectric strength the spherical electrodes are placed in :

(A) horizontal configuration

(B) vertical configuration

(C) any configuration

(D) spherical electrodes are not used

79. The incremental generating costs of two generating units are given by :

$$IC_1 = 0.1\ P_1 + 20 \text{ Rs/MW-hr}$$

$$IC_2 = 0.15\ P_2 + 18 \text{ Rs/MW-hr}$$

where P_1 and P_2 are power (in MW) generated by the two units. For a total demand of 300 MW, the value (in MW) of P_1 and P_2 will be respectively :

(A) 172 and 128

(B) 128 and 172

(C) 175 and 125

(D) 200 and 100

80. Equal area criterion gives the information regarding :

(A) stability region

(B) absolute stability

(C) relative stability

(D) swing curves

81. Which of the following is on the bank of river Sutlej ?

(A) Namohal (B) Ghumarwin

(C) Kandraur (D) Berthin

82. Which pass joins Chamba and Pangi ?

(A) Kugati (B) Kalicho

(C) Sach (D) All of these

83. At what age did Sansar Chand II occupy the throne of Kangra after the death of his father Tek Chand ?

(A) Six years (B) Ten years

(C) Sixteen years (D) Twenty years

84. Raja of which princely state spear-headed the efforts of hill chiefs to invite the Gurkhas to invade Kangra ?

(A) Mandi (B) Suket

(C) Kehlur (D) Sirmaur

85. Which raja of Bushahar gave shelter to Subedar Bhim Singh who was imprisoned by the British for leading a revolt against them at Jutog Cantt ?

(A) Ram Singh (B) Rudar Singh

(C) Shamsher Singh (D) Vijay Singh

86. In which District of H.P. is Hibra power project ?

(A) Kinnaur (B) Shimla

(C) Kullu (D) Chamba

87. In which District of H.P. is Tundah sanctuary ?

(A) Chamba (B) Kangra

(C) Una (D) Solan

88. Where is Halda festival celebrated ?

(A) Kunihar Valley of Solan District

(B) Chandra and Bhaga Valleys of Lahul-Spiti

(C) Paonta-Doon Valley of Sirmaur

(D) Danwin Valley of Bilaspur

89. When was Jan Dhan Yojna launched in H.P. ?

(A) August 2014 (B) October 2014

(C) November 2014 (D) December 2014

90. Which of the following film stars was born in H.P. ?

(A) Yami Gautam (B) Shilpa Shetty

(C) Priyanka Chopra (D) None of these

91. Who is the author of *Atal Bihari Vajpayee : A Man for all Seasons* ?

(A) Kingshuk Nag (B) M.J. Akbar

(C) Jaswant Singh (D) None of these

92. With which Indian community is the custom of Santhara associated ?

(A) Sikhs (B) Parsis

(C) Jains (D) Christians

93. When was Amar Jawan Jyoti installed at the India Gate in New Delhi ?

(A) after 1962 India-China border war

(B) after 1965 Pak-India war

(C) after 1971 liberation of Bangladesh

(D) after the 1999 Kargil conflict

94. In the present Haryana Vidhan Sabha the BJP has about 47 MLAs. Out of them how many are first timers ?

(A) 17 (B) 23

(C) 39 (D) 42

95. When was Planning Commission, which has since been replaced by Niti Ayog, set up ?

(A) March 1950 (B) July 1951

(C) October 1951 (D) January 1952

96. According to the list drawn by wealth X and business invester who is the richest man in the world ?

(A) Mark Zuckerberg (B) Jeffrey Bezos

(C) Bill Gates (D) Warden Buffet

97. With which of the following is Sundar Pichai associated ?

(A) Google (B) Microsoft

(C) Nokia (D) Master Card

98. Where is the headquarters of International Tribunal for the law of Sea ?

(A) Geneva (B) Brussels

(C) Hamberg (D) Paris

99. Whose New Year is called Rosh Hashanah ?

(A) Parsis (B) Jews

(C) Bhils (D) Nagas

100. Who was given the 2015 Nobel Prize for literature ?

(A) Svetlana Alexievich (B) Alix Michel

(C) Marlon James (D) None of these