

उम्मीदवार इस पुस्तिका के सबसे ऊपरी सील को खोलकर पृष्ठ संख्या 2 और 3 के मध्य स्थापित OMR उत्तर शीट को निकाल लें।
Candidates should open the top side of the seal of this Booklet and take out the OMR Answer Sheet placed at page no. 2 and 3.

पुस्तिका सं. :
Booklet No. :

परीक्षा पुस्तिका शृंखला : **A**
Test Booklet Series :

BEC

परीक्षा प्रश्न-पुस्तिका / EXAMINATION QUESTION BOOKLET

निर्धारित समय : 180 मिनट
Time Allowed : 180 Minutes

ELECTRONICS & COMMUNICATION

अधिकतम अंक : 120
Maximum Marks : 120

रोल नं. :
Roll No. :

उत्तर शीट सं. :
Answer Sheet No. :

प्रश्नों के उत्तर देने से पहले निम्नलिखित अनुदेशों को ध्यान से पढ़ लें। / Read the following instructions carefully before you begin to answer the questions.

उम्मीदवारों के लिए अनुदेश	Instructions to the Candidates
<p>1. प्रश्नों के उत्तर लिखना आरंभ करने से पहले आप इस पुस्तिका की जाँच करके सुनिश्चित कर लें कि इसमें पूरे पृष्ठ (1-24) हैं तथा कोई पृष्ठ या उसका भाग कम या दुबारा तो नहीं आ गया है। उम्मीदवारों को यह भी जाँच करनी है कि उनको केवल उस स्ट्रीम की सही परीक्षा-पुस्तिका मिली है जिसके लिए उन्होंने आवेदन किया है और जो उनके Admit Card में छपा है अर्थात् कंप्यूटर साइंस या इलेक्ट्रॉनिक्स & कम्यूनिकेशन। यदि आप इस पुस्तिका में कोई त्रुटि पाएँ, तो तत्काल इसके बदले दूसरी पुस्तिका लें।</p> <p>2. ओएमआर उत्तर-शीट प्रश्न पुस्तिका में ही उपलब्ध रहेगी। कृपया सुनिश्चित करें कि ओएमआर शीट संख्या और परीक्षा पुस्तिका संख्या समान हैं। ओएमआर शीट पर जानकारी भरने से पहले ओएमआर शीट पर छपे निर्देशों को ध्यान से पढ़ें। आपको ओएमआर उत्तर-पत्रक पर सभी विवरणों को सही ढंग से पूरा और कोड करना होगा, ऐसा न करने पर आपकी उत्तर पुस्तिका का मूल्यांकन नहीं किया जा सकता है। प्रश्नों का उत्तर देना शुरू करने से पहले आपको ओएमआर उत्तर-पत्रक पर दिये गए निर्धारित स्थान पर अपने हस्ताक्षर करने होंगे। इन निर्देशों का पूर्ण रूप से पालन किया जाना चाहिए, ऐसा न करने पर आपकी ओएमआर उत्तर-पुस्तिका का मूल्यांकन नहीं किया जा सकता है।</p> <p>3. ओएमआर उत्तर-शीट तीन प्रतियों में होंगी (मूल तथा कार्बन की दो प्रतिलिपियाँ)। परीक्षा समाप्ति के बाद ओ.एम.आर. की मूल शीट तथा एक कार्बन प्रतिलिपि निरीक्षक को सौंपने के पश्चात् उम्मीदवार अपने साथ एक कार्बन प्रतिलिपि ले जा सकते/सकती हैं। यदि कोई भी उम्मीदवार ऐसा करने में असफल रहता/रहती है तो उसकी उम्मीदवारी रद्द कर दी जायेगी। यदि कोई उम्मीदवार अपनी कार्बन प्रतिलिपि में किसी भी प्रकार का फेर-बदल कर उसका दावा करता/करती है तो इस स्थिति में भी उसका/उसकी उम्मीदवारी रद्द की जायेगी।</p> <p>4. इस प्रश्न-पुस्तिका में 120 बहुविकल्पीय प्रश्न हैं। प्रत्येक प्रश्न के 4 विकल्प दिए गए हैं, (A), (B), (C) और (D)। किसी भी स्थिति में प्रत्येक प्रश्न का केवल एक विकल्प ही सही उत्तर है। यदि आपको एक से अधिक विकल्प सही लगें तो सबसे अधिक उचित एक विकल्प का चुनाव करें और उत्तर शीट में सम्बंधित प्रश्न के सामने वाले उपयुक्त गोले को काला करें।</p> <p>5. प्रश्न पुस्तिका में दो भाग हैं : भाग A : सामान्य (42 प्रश्न) और भाग B : तकनीकी (78 प्रश्न)। उम्मीदवार को दोनों भागों के उत्तर लिखना अनिवार्य है।</p> <p>6. प्रत्येक सही उत्तर के लिए 1 अंक दिया जाएगा और प्रत्येक गलत उत्तर के लिए 0.25 अंक काट लिया जाएगा।</p> <p>7. गोले को काला करने के लिए केवल काले/नीले बॉल प्वाइंट पेन का प्रयोग करें। गोले को एक बार काला करने के बाद इसको मिटाने या बदलने की अनुमति नहीं है। यदि किसी प्रश्न के सामने एक से ज्यादा गोले काले किये गए हों तो मशीन द्वारा उसके लिए शून्य अंक दिया जाएगा।</p> <p>8. किसी भी स्थिति में उत्तर शीट को न मोड़ें।</p> <p>9. उत्तर-पुस्तिका पर कोई भी रफ कार्य नहीं करना है। रफ कार्य के लिए इस पुस्तिका में स्थान दिया गया है।</p> <p>10. परीक्षा हॉल/कमरों में मोबाइल फ़ोन तथा बेतार संचार साधन पूरी तरह निषिद्ध हैं। उम्मीदवारों को उनके अपने हित में सलाह दी जाती है कि मोबाइल फ़ोन/किसी अन्य बेतार संचार साधन को स्विच ऑफ़ करके भी अपने पास न रखें। इस प्रावधान का अनुपालन न करने को परीक्षा में अनुचित उपायों का प्रयोग माना जायेगा और उनके विरुद्ध कार्यवाही की जाएगी, जिसमें उनकी उम्मीदवारी रद्द करना भी शामिल है।</p> <p>11. अभ्यर्थी अपनी उत्तर पुस्तिका पर्यवेक्षक को सौंपे बिना और अपने रोल नंबर के सामने उचित स्थान पर उपस्थिति पत्रक पर हस्ताक्षर किए बिना परीक्षा हॉल/कक्ष से बाहर नहीं जा सकता। इसके अलावा अभ्यर्थी को उपस्थिति पत्रक पर हस्ताक्षर करने से पहले यह भी सुनिश्चित करना चाहिए कि बुकलेट नंबर, बुकलेट सीरीज और ओएमआर उत्तर पुस्तिका संख्या सही ढंग से लिखी गई हो। ऐसा ना करने पर, ओएमआर उत्तर पुस्तिका को अमान्य माना जाएगा/मूल्यांकन नहीं किया जा सकता है।</p>	<p>1. Before you start to answer the questions you must check this booklet and ensure that it contains all the pages (1-24) and see that no page or portion thereof is missing or repeated. Candidates are also required to check that they have got the right question booklet strictly from the stream candidate has applied for and printed on the Admit Card i.e. Computer Science OR Electronics & Communication. If you find any defect in this Booklet, you must get it replaced immediately.</p> <p>2. OMR Answer-Sheet is within the Question Booklet. Please ensure OMR Answer-Sheet number and Test Booklet No. of Question Paper are same. Read the instructions printed on OMR Answer-Sheet carefully before filling the information on the OMR Answer-Sheet. You must complete and code all the details on the OMR answer sheet correctly failing which your answer sheet may not be evaluated. You must also put your signature on the OMR Answer-Sheet at the prescribed place before you actually start answering the questions. These instructions must be fully complied with, failing which, your OMR Answer-Sheet may not be evaluated.</p> <p>3. The OMR Answer-Sheet will be in triplicate (Original and two carbon copies). Candidate has to take one carbon copy (marked as 'candidate copy') with him/her after examination and handover the original OMR along with one carbon copy to invigilator. If candidate fails to handover the original OMR along with one carbon copy to invigilator, his /her candidature will be cancelled. Further, if the candidate tampers with candidate OMR carbon copy and claims for same, in that case also his/her candidature will be cancelled.</p> <p>4. This booklet consists of 120 Multiple Choice Questions. Each question has 4 (four) alternatives (A), (B), (C) and (D). In any case only one alternative will be the correct answer. In case if you find more than one correct answer, then choose the most appropriate single option and darken the appropriate circle in the answer sheet in front of the related question.</p> <p>5. Question Booklet consists of two parts : Part A : Generic (having 42 questions) and Part B : Technical (having 78 questions). Candidates has to attempt both parts compulsorily.</p> <p>6. For each correct answer One mark will be given and for each incorrect answer 0.25 marks will be deducted.</p> <p>7. Use Black/Blue ball point Pen to darken the circle. Answer once darkened is not allowed to be erased or altered. Against any question if more than one circle is darkened, machine will allot zero mark for that question.</p> <p>8. Do not fold answer sheet in any case.</p> <p>9. No rough work is to be done on the Answer-Sheet. Space for rough work has been provided in this booklet.</p> <p>10. Mobile phones and wireless communication devices are completely banned in the examination hall/rooms. Candidates are advised not to keep mobile phones/any other wireless communication devices with them even switching it off, in their own interest. Failing to comply with this provision will be considered as using unfair means in the examination and action will be taken against them including cancellation of their candidature.</p> <p>11. Candidate should not leave the examination hall / room without handing over his/her Answer-Sheet to the invigilator and without signing on the attendance sheet at proper place against your roll number, further candidate should also ensure that booklet no., booklet series and OMR Answer-Sheet No. are correctly written on attendance sheet before signing on it, failing in doing so, may lead to disqualification / no evaluation of OMR Answer-Sheet.</p>

जब तक आपसे कहा न जाए तब तक प्रश्न-पुस्तिका न खोलें / DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

उम्मीदवार का नाम/Name of Candidate : _____ उम्मीदवार के हस्ताक्षर/Signature of Candidate : _____

PART - A

GENERIC

1. Ten eggs are distributed among ABCD in ratio 1 : 2 : 3 : 4 randomly. It is known that A gets less eggs than B, and C gets more eggs than D. If A gets half the number of eggs of B, then which one of the following is necessarily true ?

- (A) C gets an even number of eggs
(B) D gets an even number of eggs
(C) C gets an odd number of eggs
(D) D gets an odd number of eggs

2. If the number $467X4$ is divisible by 9, find the value of the digit marked as X.

- (A) 4 (B) 5
(C) 6 (D) 7

3. Today it is Thursday. After 132 days, it will be :

- (A) Monday (B) Sunday
(C) Wednesday (D) Thursday

4. Choose the word which is least like the other words in the group :

- (A) Shimmer (B) Simmer
(C) Glimmer (D) Glint

5. It is 8.00 p.m., when can Hemant get next bus for Ramnagar from Dhanpur ?

- (I) Buses for Ramnagar leave after every 30 minutes, till 10 p.m.

- (II) Fifteen minutes ago, one bus has left for Ramnagar.

- (A) If the data in statement I alone are sufficient to answer the question

- (B) If the data in statement II alone are sufficient to answer the question.

- (C) If the data either in I or II alone are sufficient to answer the question.

- (D) If the data in both the statements together are needed.

6. A water tank is 30 m long, 20 m wide and 12 m deep. It is made of iron sheet which is 3 m wide. The tank is open at the top. If the cost of iron sheet is Rs. 10 per meter, what is the total cost of iron sheet required to build the tank ?

- (A) Rs. 6000 (B) Rs. 8000
(C) Rs. 9000 (D) Rs. 10,000

7. Consider the following relationships among members of a family of six persons A, B, C, D, E and F :

- (i) The number of males equals that of females.
- (ii) A and E are sons of F.
- (iii) D is the mother of two, one boy and one girl.
- (iv) B is the son of A.
- (v) There is only one married couple in the family at present.

Which one of the following inferences can be drawn from the above?

- (A) A, B and C are all females
- (B) A is the husband of D
- (C) E and F are children of D
- (D) D is the daughter of F

8. The tops of two poles are connected by a wire. The heights of the poles are 10 m and 14 m respectively. If the wire makes a 30° angle with the horizontal, find the length of the wire ?

- (A) 7 m (B) 7.5m
- (C) 8m (D) 9.5m

9. The total number of digits used in numbering the pages of a book having 366 pages is :

- (A) 730 (B) 792
- (C) 990 (D) 1098

10. Choose the correct conclusion for the given statements :

Statement I: All athletes in the Asian athletics teams are talented.

II: All Indian athletes are now in the Asian athletics team.

Conclusions :

- (A) Some Indian athletes are talented.
- (B) All Indian athletes are talented.
- (C) India does not have any athletics team.
- (D) India has more cricketers than athletes.

11. The following question is based on the information given below :

Data of 450 candidates, who took part in an examination in social sciences, Mathematics and Science is given as below :

Number of Students who :

- * passed in all subjects are 167
- * failed in science = 191
- * failed in Mathematics = 199
- * failed in Social sciences = 175
- * failed in all subjects = 60
- * passed in Science only = 52
- * passed in Mathematics only = 48
- * passed in Social science only = 62.

How many failed in two subjects only ?

- (A) 162 (B) 152
- (C) 100 (D) 52

12. In a family of six persons A, B, C, D, E and F, there are two married couples. The family has equal number of male and female.
- D is the grandmother of A and mother of B
 - C is the wife of B and mother of F.
 - F is the granddaughter of E.
- Which of the following is true?
- A is the brother of F
 - A is the sister of F
 - D has two grandsons
 - None of these
13. Find the wrong term in the series 5, 11, 29, 83, 245, 765, 2189, 6563
- 245
 - 765
 - 2189
 - 6563
14. A clock is set at 4 am. It loses 16 minutes in 24 hours. What will be the correct time when the clock indicates 9 pm on the 4th day ?
- 8 pm
 - 7 pm
 - 10 pm
 - 11 pm
15. A man rows downstream at 20 km/hr and rows upstream at 15 km/hr. At what speed he can row in still water ?
- 17.5 km/hr
 - 18 km/hr
 - 20.5 km/hr
 - 22 km/hr
16. Four years ago a man was 6 times as old as his son. After 16 years he will be twice as old as his son. What is the present age of man and his son ?
- 34, 9
 - 33, 7
 - 35, 5
 - 36, 6
17. Which of the following set of letters complete the letter series, when sequentially placed at the gaps ?
- _ bc _ ca _ aba _ c _ ca
- abcbb
 - bbbcc
 - baaba
 - abbcc
18. Which of the following will be the changed form of the word "OBLIQUE" when the word is written again by substituting each vowel by the second letter following it in the English alphabet and substituting each consonant by the third letter following it in the English alphabet ?
- MEDGTSD
 - QEOKTXG
 - QEOKTWG
 - RDNLSXH

19. Arrange the given words in alphabetical order and tick the one that comes at the second place.

- (A) Interfere (B) Interlude
(C) Intestine (D) Interview

20. **Assertion (A) :** Increase in carbon dioxide would melt polar ice.

Reason (R) : Global temperature would rise.

- (A) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(B) Both (A) and (R) are true and (R) is the correct explanation of (A)
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

21. Following question contains four arguments of three sentences each. Choose the set in which the third statement is a logical conclusion of the first two.

- I. All envelopes are rectangles. All rectangles are rectangular. All envelopes are rectangular.
II. Some things are smart. Some smart things are tiny. All things are tiny.
III. Learneds are well read. Well read know. Learneds know.
IV. Dieting is good for health. Health foods are rare. Dieting is rare.

- (A) IV only (B) III only
(C) Both I and III (D) All of these

22. Hypsiphobia: Height :: Hylophobia: ?

- (A) Forests
(B) Animals
(C) Water
(D) All of the above

23. A told B, "Yesterday I met the only brother of the daughter of my grandmother". Whom did A meet ?

- (A) Cousin (B) Brother
(C) Father (D) Son

24. Sum of present age of Suresh and Dinesh is equal to the age of Hema six years back. Five years from now, the ratio of age of Suresh and Dinesh will be 3:2. Rajesh is 5 years older than Hema and his present age is four times the present age of Suresh. What is present age of the Dinesh ?

- (A) 1 year (B) 10 years
(C) 2 years (D) 12 years

25. What is the average of first five multiples of 12 ?

- (A) 36 (B) 38
(C) 40 (D) 42

26. If TOUR is written in a certain code as 1234, CLEAR as 56784 and SPARE as 90847, what will be the 5th Digit for SCULPTURE in the same code ?

- (A) 3 (B) 4
(C) 6 (D) 0

27. Which largest number of five digits is divisible by 99 ?

- (A) 99999 (B) 99981
(C) 99909 (D) 99990

28. Read following information and answer the question.

- (i) There is a group of five persons, P, Q, R, S and T.
(ii) One of them is a Horticulturist, one is Physicist, one is Journalist, one is Industrialist and one is an Advocate.
(iii) Three of the P, R and the Advocate prefer tea to coffee and two of them Q and Journalist prefer coffee to tea.
(iv) The industrialists, S and P are friends of one another but two of them prefer coffee to tea.
(v) The Horticulturist is R's brother.

Who is industrialist ?

- (A) P (B) Q
(C) R (D) S

29. In a race of 600 m, A can beat B by 50 m, and in another race of 500 m, B can beat C by 60 m. Then by how many meters will A beat C in a race of 400 meters ?

(A) $77\frac{1}{3}$ m

(B) 80 m

(C) 70 m

(D) None of these.

30. Gold is 19 times as heavy as water and copper 9 times as heavy as water. In what ratio should these metal be mixed so that the mixture may be 15 times as heavy as water ?

(A) 3 : 2 (B) 9 : 5

(C) 2 : 3 (D) 7 : 5

31. The first republic day of India was celebrated on January 26, 1950. What day of the week was it ?

(A) Wednesday (B) Friday

(C) Thursday (D) Tuesday

32. Ramesh and Suresh enter into a partnership with capitals in the ratio of 10 : 12. At the end of 8 months, Ramesh withdraws. If they receive profits in the ratio of 10 : 18. Find how long Suresh's capital was used.

- (A) 7 months (B) 8 months
(C) 10 months (D) 12 months

33. The first line (P) and last line (U) of the question are fixed. Arrange the other four lines in a logical sequence.

- P. First, take five minutes to meditate for peace.
Q. Allow them to radiate from your stillness out into your body.
R. Bring into your mind anyone against whom you have a grievance and let it go.
S. Close your eyes.
T. Put your attention on your heart and inwardly repeat the words : Peace, harmony, laughter, love.
U. Then introduce the intention of peace in your thoughts. After a few moments of silence, repeat this prayer; let me be loved, happy and peaceful; let my friends, my perceived enemies, all beings in the world be happy, loved, and peaceful too.

- (A) RQTS (B) RSTQ
(C) TQSR (D) STQR

34. In the following question, a statement is followed by two assumptions numbered I and II. Consider the statement and the following assumptions to decide which of the assumptions is implicit in the statement :

Statement : All the employees are notified that the organization will provide transport facilities at half the cost from the nearby railway station to the office except those who have been provided with travelling allowance.

Assumption :

- I. Most of the employees will travel by the office transport.
II. Those who are provided with travelling allowance will not read such notice.

- (A) If only assumption I is implicit;
(B) If either I or II is implicit;
(C) If only assumption II is implicit;
(D) If neither I nor II is implicit.

35. A train moving at 50 km/hr crosses a bridge in 45 seconds. The length of train is 150 meters. Find the length of the bridge.

- (A) 525 m (B) 545 m
(C) 475 m (D) 575 m

36. In the following question, a number series is given with one term missing. Choose the correct alternative that will continue the same pattern and fill in the blank spaces.

97, 86, 73, 58, 45, (...)

- (A) 24 (B) 34
(C) 44 (D) 54

37. Three pipes A, B and C can fill a cistern in 8 minutes, 12 minutes and 16 minutes respectively. What is the time taken by three pipes to fill the cistern when they are opened together ?

- (A) 3.7 minutes (B) 6 minutes
(C) 4.5 minutes (D) 5 minutes

38. What is the compound interest on Rs. 2500 for 2 years at rate of interest 4% per annum ?

- (A) Rs. 180 (B) Rs. 204
(C) Rs. 210 (D) Rs. 220

39. There are five persons sitting on a bench. Blue eyed lady sitting in the middle is my mother. At the extreme left, the man with grey hair is my maternal uncle. Lady sitting at the extreme right is having a pimple on her nose and is the wife of person who is sitting between blue eyed lady and grey haired man and has a pointed nose. A lady having marks on her face is the younger sister of the blue eyed lady and sitting on the remaining fifth place. The person having a pointed nose is the son of the blue eyed lady. What is the lady having marks on her face to the man sitting at extreme left ?

- (A) Wife
(B) Maternal Aunt
(C) Sister
(D) Sister-in-law

40. Find the odd one out :

4, 9, 256, 529, 573

- (A) 256 (B) 573
(C) 529 (D) 9

41. In a code, CORNER is written as GSVRIV. How can CENTRAL be written in that code?

- (A) GIRXVEP (B) GJRYVEP
(C) GNFKKER (D) DFOUSBM

42. $P+Q$ means P is the brother of Q; $P-Q$ means P is the mother of Q and $P \times Q$ means P is the sister of Q. Which of the following means M is the maternal uncle of R ?

- (A) $M-R+K$ (B) $M+K-R$
(C) $M+K \times R$ (D) $M+K+R$

PART - B

TECHNICAL

43. The bit sequence 1011 is serially entered (right-most bit first) into a 4-bit parallel out shift register that is initially clear. What are the Q outputs after three clock pulses ?

(A) 0110
(B) 0010
(C) 1000
(D) 1100

44. A real band-limited random process has two-sided power spectral density (watts / Hz) :

$$S_x(f) = \begin{cases} 10^{-6} (3000 - |f|); & \text{for } |f| \leq 3 \text{ kHz} \\ 0; & \text{otherwise} \end{cases}$$

where f is the frequency in Hz. The signal $x(t)$ modulates a carrier $\cos(16000\pi t)$ and the resultant signal is passed through an ideal band-pass filter of unity gain with the center frequency of 8 kHz and bandwidth of 2 kHz. The output power in watts is _____.

(A) 2.3 (B) 7.8
(C) 2.5 (D) 3.6

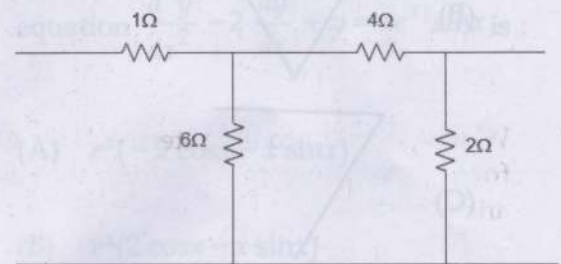
45. Effective density of state near conduction band $N_c = 4.7 \times 10^{17} \text{ cm}^{-3}$ at 300 K. What is the effective density of state (in cm^{-3}) near conduction band at 600 K ?

(A) 4.7×10^{17} (B) 18.8×10^{17}
(C) 13.29×10^{17} (D) 132.9×10^{17}

46. If $f(z) = \phi(x, y) + i\psi(x, y)$ is an analytic function and $\phi - \psi = e^x(\cos y - \sin y)$, $f'(0) = 1$, then $f(z)$ is :

(A) $f(z) = e^z + c$, where c is arbitrary
(B) $f(z) = ze^z + c$, where c is arbitrary
(C) $f(z) = e^z(1 - z) + c$, where c is arbitrary
(D) $f(z) = e^z(1 + z) + c$, where c is arbitrary

47. Consider the circuit shown in figure. The Z parameter will be :

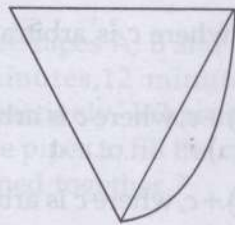


(A) $Z_{12} = Z_{21}$ (B) $Z_{22} = 4 Z_{21}$
(C) $Z_{11} = Z_{22}$ (D) $Z_{12} = 2 Z_{21}$

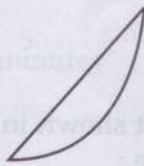
48. If the independent random variable X and Y are binomially distributed, respectively with $n = 4$, $p = 1/4$, and $n = 5$, $p = 1/4$. The probability that $X + Y \geq 1$ is :

- (A) $1 - \left(\frac{3}{4}\right)^9$
 (B) $1 - \left(\frac{3}{4}\right)^4 - \left(\frac{3}{4}\right)^5$
 (C) $\left(\frac{3}{4}\right)^4 + \left(\frac{3}{4}\right)^5$
 (D) $\left(\frac{3}{4}\right)^9$

49. Which of the following is not a tree to the graph shown in figure ?



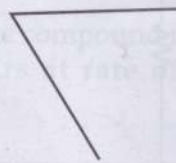
(A)



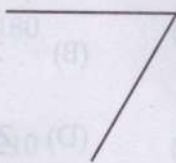
(B)



(C)



(D)



50. The power dissipation of a Si diode having $I_D = 30$ mA is _____.

- (A) 21 W (B) 21 mW
 (C) 210 mW (D) 2.1 W

51. The iterative formula to find the q^{th} root of a natural number N using Newton-Raphson method is :

- (A) $x_{n+1} = \frac{1}{q} \left[qx_n + \frac{N}{x_n^{q-1}} \right], n \in N$
 (B) $x_{n+1} = \frac{1}{q} \left[qx_n - \frac{N}{x_n^{q-1}} \right], n \in N$
 (C) $x_{n+1} = \frac{1}{q} \left[(q-1)x_n + \frac{N}{x_n^{q-1}} \right], n \in N$
 (D) $x_{n+1} = \frac{1}{q} \left[(q-1)x_n - \frac{N}{x_n^{q-1}} \right], n \in N$

52. The 3-dB bandwidth of the low-pass signal $e^{-t} u(t)$, where $u(t)$ is the unit step function, is given by :

- (A) $1/2\pi$ Hz
 (B) $1/2\pi \sqrt{(\sqrt{2}-1)}$ Hz
 (C) ∞ Hz
 (D) 1 Hz

53. The particular solution of the partial

differential equation $\frac{\partial^2 z}{\partial x^2} + z = 0, z = e^y$

and $\frac{\partial z}{\partial x} = 1$ at $x=0$ is :

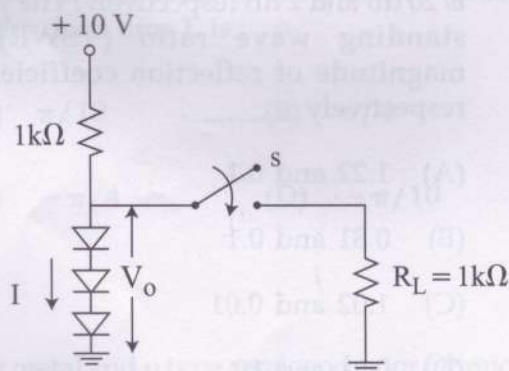
(A) $z = e^y (\cos x + \sin x)$

(B) $z = e^y (\cos x - \sin x)$

(C) $z = e^y \cos x + \sin x$

(D) $z = \cos x + e^y \sin x$

54. Consider the circuit shown below :



For each diode $\eta = 2, V_\gamma = 0.7 \text{ V}$, dc forward resistance of diode is $R_f = 0\Omega$. Assuming when initially S is open $V_o = 2.1 \text{ V}$; for this condition find the incremental resistance in the circuit.

(A) 6.56Ω

(B) 20Ω

(C) 19.68Ω

(D) 7.9Ω

55. Let A and B be two events such that

$$P(A) = \frac{3}{4} \text{ and } P(B) = \frac{5}{8}, \text{ then the}$$

Statement (a) : $P(A \cup B) \geq \frac{3}{4}$.

Statement (b) : $\frac{3}{8} \leq P(A \cap B) \leq \frac{5}{8}$

Which of the following option is correct?

(A) Both statements (a) and (b) are true.

(B) Statement (a) is true but statement (b) is false.

(C) Statement (a) is false but statement (b) is true.

(D) Both statements (a) and (b) are false.

56. The particular integral of the differential

equation $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + y = x e^x \sin x$ is :

(A) $e^x (-2 \cos x - x \sin x)$

(B) $e^x (2 \cos x - x \sin x)$

(C) $e^x (-2 \cos x + x \sin x)$

(D) $e^x (2 \cos x + x \sin x)$

57. The basic architecture/ Von-Neumann architecture of computer had :

- (A) Arithmetic, and Logical Memory Unit (ALU)
- (B) Control Unit
- (C) Registers, and Inputs/Outputs
- (D) All of the above

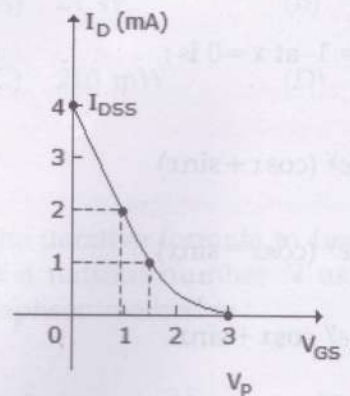
58. At 20GHz, the gain of a parabolic dish antenna of 2 meter diameter and 70% efficiency is :

- (A) 47dB
- (B) 54dB
- (C) 51dB
- (D) 45dB

59. Discrete samples of an analog signal are uniformly quantized to PCM. If the maximum value of analog signal is to be represented within 0.1% accuracy, then the minimum number of binary digits required per sample is _____.

- (A) 4
- (B) 8
- (C) 10
- (D) 12

60. Consider the figure. The maximum trans-conductance will be :



- (A) $8/3 \text{ m mho}$
- (B) $4/3 \text{ m mho}$
- (C) $4/3 \text{ mho}$
- (D) $8/3 \text{ mho}$

61. The return loss and insertion loss of a filter is 20 dB and 2 dB respectively. The voltage standing wave ratio (VSWR) and magnitude of reflection coefficient are respectively _____.

- (A) 1.22 and 0.1
- (B) 0.81 and 0.1
- (C) 1.02 and 0.01
- (D) 0.81 and 10

62. Consider a uniformly doped Silicon p-n junction with doping concentration $N_a = 10^{18} \text{ cm}^{-3}$ and $N_d = 10^{14} \text{ cm}^{-3}$. What is the value of built in potential V_{bi} at temperature 300K ? $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$.

- (A) 0.754V
- (B) 0.745V
- (C) 0.694V
- (D) 0.547V

63. An engineer is asked to design an M-ary PSK system. The bit rate of the data to be transmitted is 200 kbps and the channel bandwidth available is 100 kHz. To avoid inter-symbol interference, he decides to use raised cosine pulse with roll off factor 0.25. What minimum value of M is required for distortion less transmission ?
- (A) 8
(B) 2
(C) 16
(D) none of these
64. The loop transfer function of a system is given by $G(s)H(s) = \frac{10e^{Ls}}{s(s+1)}$. The phase crossover frequency is 1 rad/s. The value of the dead time L is :
- (A) $\pi/10$ (B) $\pi/4$
(C) $-\pi/4$ (D) $-\pi/10$
65. For metal and p type semiconductor Ohmic contact, work function of metal ϕ_m & semiconductor ϕ_s will be _____
- (A) $\phi_m < \phi_s$
(B) $\phi_m = \phi_s$
(C) $\phi_m > \phi_s$
(D) $\phi_m \neq \phi_s$
66. Consider a discrete time periodic signal $x(n) = \sin(2\pi n/5)$. Let a_k be the complex Fourier coefficients of $x(n)$. The coefficients $\{a_k\}$ are non-zero when $k = Bm \pm 1$, where m is any integer. The value of B is ?
- (A) 5 (B) 9
(C) 10 (D) 11
67. The value of m for m-derived low pass filter of cut-off frequency 2 kHz, design impedance of 400 Ω and the resonant frequency of 2200 Hz is :
- (A) 0.216 (B) 0.316
(C) 0.416 (D) 0.516
68. A signal $x(t)$ has a Fourier transform $X(w)$. If $x(t)$ is a real and odd function of t, then $X(w)$ is :
- (A) A real and even function of w
(B) An imaginary and odd function of w
(C) An imaginary and even function of w
(D) A real and odd function of w
69. Which instruction is the example of register indirect addressing mode ?
- (A) MOV AX, [BX]
(B) MOV AX, [2500H]
(C) MOV AX, 1234H
(D) MOV AX, 0005H

70. A NMOS amplifier has the drain resistor $R_d = 20,000 \Omega$. The DC parameters are found to be voltage across the drain resistor $V_{rd} = 2.5V$ and the gate-to-source bias voltage $V_{gs} = 1.25 V$. The AC measurements with small signals show the voltage gain to be $-10 V/V$. What is the value of V_t for this transistor ?
- (A) 0.75V (B) 0.8V
(C) 0.9V (D) 1.0V
71. The number of bits in a binary PCM system is increased from n to $n+1$. As a result, the signal quantization noise ratio will improve by a factor _____.
- (A) $\frac{n+1}{n}$
(B) $2^{\left(\frac{n+1}{n}\right)}$
(C) $2^{2\left(\frac{n+1}{n}\right)}$
(D) which is independent of n .
72. If $r = \begin{pmatrix} \rightarrow \\ r \end{pmatrix}$ where $r = x\hat{i} + y\hat{j} + z\hat{k}$ then $\text{grad} \left| \begin{pmatrix} \rightarrow \\ r \end{pmatrix} \right|^2 =$
- (A) $\frac{\rightarrow}{r}$
(B) $\rightarrow 0$
(C) $\rightarrow r$
(D) $2\rightarrow r$
73. Program Counter is realized using _____, in the ARM processor.
- (A) Caches
(B) General purpose register
(C) Heaps
(D) Stack
74. For a Hertz dipole antenna, the half power beam width (HPBW) in the H-plane is
- (A) 0°
(B) 360°
(C) 90°
(D) can't be determined
75. A control system whose step response is $-0.5(2+e^{-2t})$ is cascaded to another control block whose impulse response is e^{-3t} . What is the transfer function of the cascaded combination ?
- (A) $\frac{1}{(s+2)(s+3)}$
(B) $\frac{1}{(s+2)(s+1)}$
(C) $\frac{-(s+1)}{s(s+2)(s+3)}$
(D) $\frac{(s+1)}{s(s+2)(s+3)}$

76. In a GSM system, eight channels can co-exist in 200 kHz bandwidth using TDMA. A GSM-based cellular operator is allocated 5-MHz bandwidth. Assuming a frequency reuse factor of 1/5, that is, a five-cell repeat pattern, the maximum number of simultaneous channels that can exist in one cell is _____.

(A) 200 (B) 40

(C) 25 (D) 5

77. The best circuit for making the operating point independent of variations in transistor parameters or temperature changes is :

(A) Base Resistor bias

(B) Collector feedback bias

(C) Potential divider bias

(D) None of the above

78. For a stable closed loop system, the gain at phase crossover frequency should always be :

(A) > 0 dB (B) < 6 dB

(C) > 6 dB (D) < 20 dB

79. Which statement is not correct for IA -32 system ?

(i) IA-32 architecture is suitable for a wide range of data types.

(ii) The IA-32 system follows CISC design.

(iii) In IA-32 architecture, uses the general flags only. Any conditional flags (TF, IOPL, IF etc.) is not provided.

(iv) The IA-32 system has protected mode, real-address mode, and a system management mode.

(A) iii (B) iv

(C) ii, iii (D) i

80. Consider a signal $x(t) = \cos(6\pi t) + \cos(16\pi t)$, where t is in seconds. The Nyquist sampling rate is (in samples per seconds) for a signal $y(t) = x(2t+5)$ is :

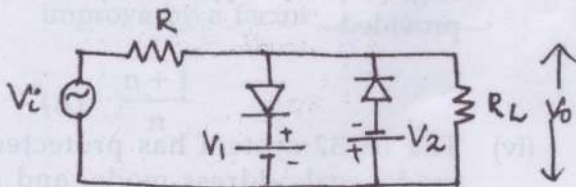
(A) 8 (B) 12

(C) 16 (D) 32

81. Let $x(t)$ be the input to a linear, time-invariant system. The required output is $4x(t-2)$. The transfer function of the system should be :

- (A) $4e^{j4\pi f}$ (B) $2e^{(-j8\pi f)}$
(C) $4e^{(-j4\pi f)}$ (D) $2e^{j8\pi f}$

82. The circuit given in the figure is :



- (A) Positive Clipper
(B) Negative Clipper
(C) Dual Clipper
(D) Clamper

83. Which instruction is not possible ?

- (A) MOV AX, BX
(B) MOV AX, [BX].
(C) MOV AL, 55H
(D) MOV 55H, BL

84. The technique/s used to effectively utilize main memory :

- (A) Address binding
(B) Dynamic loading
(C) Dynamic linking
(D) Both dynamic linking and loading

85. The 2's complement form of the subtraction of -6 and 3 is _____.

- (A) 1010 (B) 1110
(C) 0110 (D) 0111

86. A circuit designer would like to implement active resistor in his circuit design. Which is the most appropriate device to be purchased to meet the requirement ?

- (A) MOS switch
(B) SCR
(C) MOS diode
(D) All the above

87. Which architecture of the processor provides faster execution for finite number of given instructions ?

- (A) ISA
- (B) ANSA
- (C) Super-scalar
- (D) All of the options

88. Find the instantaneous frequency (at $t=0$) in Hz of signal :

$$\cos(200\pi t) \cdot \cos(5\sin 2\pi t) + \sin(200\pi t) \cdot \sin(5\sin 2\pi t)$$

- (A) 10
- (B) 90
- (C) 95
- (D) 120

89. A ripple counter consists of three J-K flip-flops having positive-logic Clock, connected with $J = K = 1$ so that each flip-flop toggles at every positive edge of the Clock. The clock input CK_0 of the first flip-flop is connected to an external Clock generator and the Clock inputs of the other flip-flops are applied from the outputs of the preceding flip-flops as follows: $CK_1 = Q_0$ and $CK_2 = Q_1'$. If the counter is initialised to the state 000, the resulting state sequence ($Q_2 Q_1 Q_0$) will be _____.

- (A) 0-3-2-5-4-7-6-1-0-...
- (B) 0-1-6-7-4-5-2-3-0-...
- (C) 0-7-6-5-4-3-2-1-0-...
- (D) Different from the three sequences given above.

90. For output $Q=0$ and $\bar{Q}=1$, the inputs of the NOR gate S-R flip-flop are :

- (A) $S=0, R=0$
- (B) $S=1, R=0$
- (C) $S=1, R=1$
- (D) $S=0, R=1$

91. The inverse Laplace transform of

$$\tan^{-1}\left(\frac{2}{s^2}\right) \text{ is :}$$

- (A) $\frac{\sin 2t}{t}$
- (B) $\frac{2 \sinh t \cdot \sin 2t}{t}$
- (C) $\frac{2 \sinh t \cdot \sin t}{t}$
- (D) $\frac{2 \sinh 2t \cdot \sin 2t}{t}$

92. A uniform plane wave in the free space is normally incident on an infinitely thick dielectric slab (relative permittivity 4). The magnitude of the reflection coefficient is :

- (A) 0 (B) 0.3
(C) 0.5 (D) 0.8

93. A voltage source having an open circuit voltage of 70 V and internal resistance of $35\ \Omega$ is equivalent to a current source of _____

- (A) 0.5 A with $35\ \Omega$ in parallel
(B) 2 A with $35\ \Omega$ in series
(C) 2 A with $35\ \Omega$ in parallel
(D) 0.5 A with $35\ \Omega$ in series

94. Two field vectors $C = 4a_x - 2a_y - a_z$ & $D = a_x + 4a_y - 4a_z$ are :

- (A) At 0° to each other and in line
(B) perpendicular
(C) Parallel
(D) at 45° to each other

95. In an AM signal, modulating frequency is 20 KHz and modulation index is 0.6. What should be the best suited RC time constant for the envelope detector ?

- (A) 0.52 ms (B) 0.01 ms
(C) 0.20 ms (D) 0.35 ms

96. Which one is a 1-byte instruction set ?

- (A) LDA 2500H
(B) MOV A, B
(C) IN 01H
(D) JMP 2085H

97. Find the average value of the function

$$f(x) = \frac{x}{\sqrt{x^2 + 16}} \text{ on } [0, 3] \text{ is :}$$

- (A) 1
(B) $1/2$
(C) $1/3$
(D) $3/2$

98. The basic difference between a square wave and a pulse generator is :

- (A) Shape of the waveform
- (B) Duty Cycle
- (C) Frequency Range
- (D) Cost

99. The set of all values of λ for which the system of linear equations :

$$2x - 2y + z = \lambda x$$

$$2x - 3y + 2z = \lambda y$$

$$-x + 2y = \lambda z \text{ has a non-trivial solution,}$$

- (A) is an empty set.
- (B) is a singleton set.
- (C) contains two elements.
- (D) contains more than two elements.

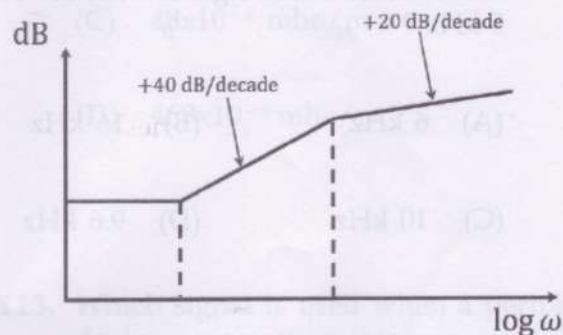
100. A waveform generator of voltage $V(t) = 12t^2$ is connected across a 4 H inductor for $t \geq 0$, with initial electric current through it being zero. The electric current through the inductor for $t \geq 0$ is given by _____

- (A) t^3
- (B) $3t^2$
- (C) $12t^3$
- (D) $4t^3$

101. In a certain TDMA system, the TDMA frame length and burst bit rate are, respectively, 20ms and 90 Mbps. If the total number of overhead bits per frame is 25000 bits, what is the TDMA frame efficiency ?

- (A) 97.5%
- (B) 90.2%
- (C) 98.6%
- (D) 96.8%

102. The Bode asymptotic plot of a transfer function is shown in figure. The transfer function has :



- (A) One pole and one zero
- (B) Two pole and one zero
- (C) One pole and two zero
- (D) None of these

103. The ALE output of the 8085A microprocessor is used to :

- (A) select a page address out of the total memory map.
- (B) load the external Address Latch from the Data Bus output.
- (C) read the Data Bus input and use it as part of the address.
- (D) do something different from the options given above.

104. What bandwidth is needed for an FM signal that has a peak deviation of +4 kHz and handles audio signals from 200 Hz to 5 kHz ?

- (A) 6 kHz (B) 16 kHz
- (C) 10 kHz (D) 9.6 kHz

105. The total power gain of a high frequency response of multistage amplifier is 4000. If the gain of first stage is 14 dB, gain of second being X dB and gain of third is 18dB, then value of 'X' will be ?

- (A) 4 dB (B) 50.32 dB
- (C) 58 dB (D) 40.32 dB

106. Intel 8080A and 8085A differ in :

- (A) Number of address line
- (B) Number of Data lines
- (C) Instruction Set
- (D) Number of Interrupts

107. A Hilbert-transform is a :

- (A) Non-linear system
- (B) Non-causal system
- (C) Time-Varying system
- (D) Low-pass system

108. SHIFT RIGHT instruction causes all bits shifted one position to right with leftmost bit set to zero. The effect is to :

- (A) multiply by 2
- (B) divide by 2
- (C) SET the most significant bit
- (D) none of these

109. A Boolean function of 4 binary variables is given by the following sum of minterms: $Y(A, B, C, D) = \Sigma(1, 2, 3, 5, 6, 7, 10, 14, 15)$. If the minimized Boolean expression for Y is obtained in the Sum of Products form, its implementation using NAND gates will require, (use NAND gates as NOT where needed)

- (A) one 3-input gate and four 2-input gates.
- (B) six 2-input gates and one 4-input gate.
- (C) one 4-input gate and four 2-input gates.
- (D) two 4-input gates and four 2-input gates.

110. It is known that a Full Adder based on two Half Adders can be built using five 2-input gates of different types. These five gates consist of

- (A) two XOR gates and three AND gates.
- (B) one XOR gate, two AND gates and two OR gates.
- (C) three XOR gates and two AND gates.
- (D) two XOR gates and three OR gates.

111. A particular band-pass function has a network function as $H(s) = \frac{s}{s^2 + 2s + 4}$ then, its quality factor Q is :

- (A) 0.5
- (B) 1
- (C) 2
- (D) 4

112. A distortion less transmission line has $R = 0.15 \text{ Ohm/m}$, $C = 80 \text{ pF/m}$, $L = 0.25 \times 10^{-6} \text{ H/m}$. The value of G will be :

- (A) 48 mho/m
- (B) 468 mho/m
- (C) $48 \times 10^{-6} \text{ mho/m}$
- (D) $468 \times 10^{-6} \text{ mho/m}$

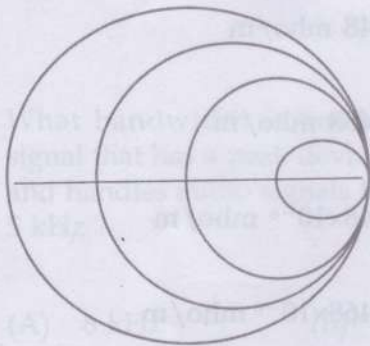
113. Which signal is used when a peripheral device requests the microprocessor to have a DMA operation :

- (A) IO/ M
- (B) READY
- (C) HOLD and HLDA
- (D) RD and WR

114. The dot multiplication of unit vectors $a_\phi \cdot a_\theta$ in cylindrical and spherical coordinate systems for vector transformation will be

- (A) $\sin\theta$ (B) 1
(C) 0 (D) $\cos\theta$

115. The smith chart used for transmission line calculations is shown below.



The circles shown in figure represent

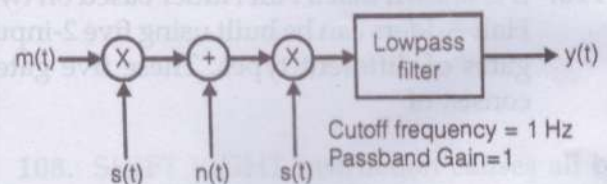
- (A) unit circles.
(B) constant resistance circles.
(C) constant reactance circles.
(D) constant reflection coefficient circles.

116. The true statement is :

- (i) The Stack follows the last-in-first-out sequence.
(ii) The stack is accessed using a pointer that is implemented using SP and SS registers.
(iii) Stack is used for temporary storage of contents of registers and memory locations, status of registers.
(iv) While retrieving data from the stack, the stack pointer is decremented by 2.

- (A) ii, iv (B) i, ii, iii
(C) i, iii, iv (D) all of them

117. In the figure, $m(t) = (2/t) \sin(2\pi t)$, $s(t) = \cos(200\pi t)$ and $n(t) = (1/t) \sin(199\pi t)$, the output $y(t)$ will be _____.



- (A) $(1/t) \sin(2\pi t)$
(B) $[(1/2t) \sin(2\pi t) + ((1/t) \sin(\pi t)) \cos(3\pi t)]$
(C) $[(1/2t) \sin(2\pi t) + ((1/t) \sin(0.5\pi t)) \cos(1.5\pi t)]$
(D) $[(1/t) \sin(2\pi t) + ((1/t) \sin(\pi t)) \cos(0.75\pi t)]$

118. Two impedances Z_1 and Z_2 are said to be inverse if ?

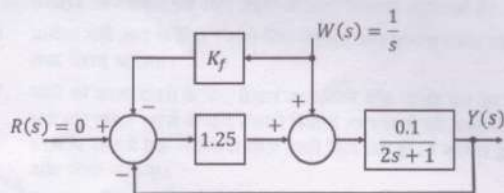
(A) $Z_1 Z_2 = R_0$

(B) $Z_1 + Z_2 = R_0$

(C) $1/Z_1 + 1/Z_2 = R_0$

(D) $Z_1 Z_2 = R_0^2$

119. The steady-state error is zero for the system given below.



(A) $K_f = 1.25$

(B) $K_f = 0.8$

(C) $K_f = 0.25$

(D) $K_f = 0$

120. The maximum and minimum values of numbers representable in a number system consisting of six bits $b_5 b_4 b_3 b_2 b_1 b_0$ having weights 32, -16, 8, -4, -2, and 1 respectively are :

(A) 127 and 0 in decimal notation.

(B) 41 and -22 in decimal notation.

(C) 127 and -127 in decimal notation.

(D) Different from the values given above.

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