CBCS SCHEME

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21EC51

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Digital Communication

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive the expression for error probability of binary phase shift keying using coherent detection. **(08 Marks)**

b. An FSK system transmits binary data at the rate of 2×10^6 bit per sec. During the source of transmission, AWGN of zero mean and two sided power spectral density 10^{-20} W/Hz is added to the signal. The amplitude of received wave for digit 1 or 0 is 1 microvolt. Determine the average probability of symbol error assuming non-coherent detection. **(06 Marks)**

c. Explain the concept of M-ary PSK. **(06 Marks)**

OR

2 a. With a neat block diagram, explain non-coherent detection of binary FSK technique. **(08 Marks)**

b. Binary data is transmitted over AWGN channel using BPSK at a rate of 1Mbps. It is desired to have average probability of error $p_e \leq 10^{-4}$. Noise PSD = 10^{-12} W/Hz. Determine the average carrier power required at receiver input if the detector is of coherent type. [Assume erfc (3.5) = 0.00025]. **(06 Marks)**

c. Explain the generation and detection of DPSK with neat block diagram. **(06 Marks)**

Module-2

3 a. Explain the geometric representation of set of in energy signals as combination of N orthonormal basis function. Illustrate the case of N = 2 and M = 3 with necessary diagrams and expressions. **(08 Marks)**

b. Explain the correlation receiver using coherent detection. **(06 Marks)**

c. Explain the design of band limited signals with controller ISI-partial response signal. **(06 Marks)**

OR

4 a. Using Gram-Schmidt orthogonalization procedure find the set of orthonormal basis function to represent the signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ as shown in Fig.Q.4(a). Also express each of these signals interms of set of basis function.

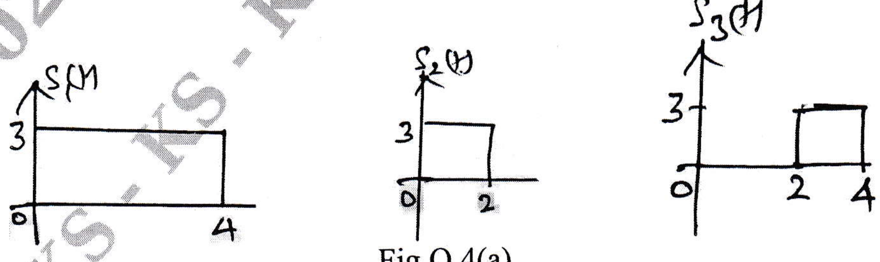

Fig.Q.4(a)

(10 Marks)

b. State and prove Nyquist condition for zero ISI. **(10 Marks)**

Module-3

5 a. Explain the model of spread spectrum digital communication system. **(10 Marks)**

b. With a neat block diagram, explain the CDMA system band on IS-95. **(10 Marks)**

OR

6 a. Explain the frequency hopped spread spectrum technique with neat transmitter and receiver block diagram. **(08 Marks)**

b. The SNR required at the detector to achieve reliable communication in a DSSS communication system is 13dB. If the interference to signal power at the receiver is 20dB. Determine the processing gain required. **(04 Marks)**

c. Write a note on application of DS spread spectrum systems. **(08 Marks)**

Module-4

7 a. Define the following with respect to information theory :

i) Self information
ii) Entropy
iii) Source efficiency
iv) Rate of information. **(08 Marks)**

b. Construct binary code for the following source using Shannon's binary encoding procedure. $s = \{s_1, s_2, s_3, s_4, s_5\}$ $p = \{0.4, 0.25, 0.15, 0.12, 0.08\}$. **(08 Marks)**

c. Explain the types of methods of controlling error. **(04 Marks)**

OR

8 a. Six messages symbols with probability of 0.4, 0.2, 0.2, 0.1, 0.07, 0.03, construct a binary code by using Shannon's Fano encoding procedure. Also determine code efficiency and redundancy. **(10 Marks)**

b. A source produces 5 symbols with probabilities of 0.1, 0.3, 0.4, 0.12 and 0.08.

i) Construct a binary Huffman code
ii) Determine efficiency and redundancy of the code
iii) Draw code-tree. **(10 Marks)**

Module-5

9 a. A (7, 4) linear block code having partly matrix $P = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$

i) Find all possible code vector
ii) Draw the encoding circuit
iii) Draw the syndrome circuit. **(10 Marks)**

b. A (3, 1, 2) convolutional code with $g^{(1)} = (110)$, $g^{(2)} = (101)$ and $g^{(3)} = (111)$.

i) Draw the encoder block diagram.
ii) Find the generator matrix.
iii) Find the code word for information sequence (11101) using transform domain approach. **(10 Marks)**

OR

10 a. For a (2, 1, 4) convolutional encoder as shown in Fig.Q.10(a). **(10 Marks)**

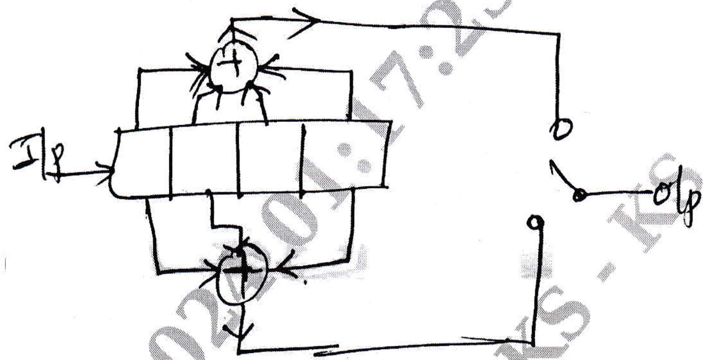

Fig.Q.10(a)

Find the codeward corresponding to the information source (10111). Using time domain and transform domain approach. **(10 Marks)**

b. A, (2, 1, 2) binary convolutional encoder as shown in Fig.Q.10(b). Draw the state table, state transition table, state diagram and corresponding code tree, for the message 10111. Find the encoded sequence.

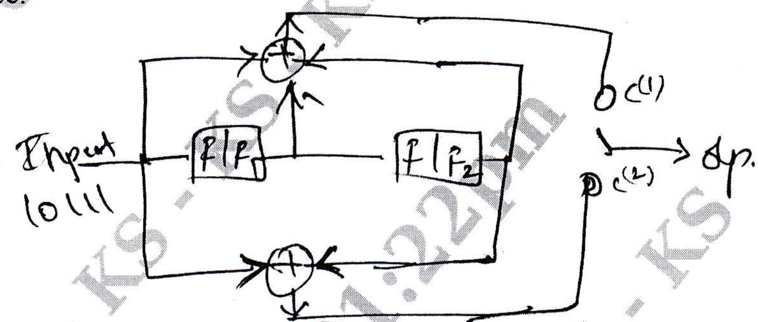

Fig.Q.10(b)

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21EC52

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Computer Organization and Arm Microcontrollers

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With a neat diagram, discuss the operational concepts in a computer highlighting the role of PC, MAR, MDR and IR. **(10 Marks)**

b. Explain system software functions in computer. **(06 Marks)**

c. Explain computer basic performance equation. **(04 Marks)**

OR

2 a. Explain operation of DMA with neat diagram. **(10 Marks)**

b. With a neat diagram, discuss implementation of interrupt priority using individual request and acknowledge lines. **(06 Marks)**

c. Illustrate with a neat diagram, a computer using different interface standards. **(04 Marks)**

Module-2

3 a. With a neat diagram, explain the internal organization of 16 × 8 memory chip. **(10 Marks)**

b. State and explain the types of read only memory and memory hierarchy. **(10 Marks)**

OR

4 a. With a neat diagram, explain the three bus organization of a datapath. **(10 Marks)**

b. Explain basic idea of pipelining and 4-stage pipeline structure. **(10 Marks)**

Module-3

5 a. With a neat diagram, explain the four main hardware components of an ARM based embedded device. **(08 Marks)**

b. Discuss ARM design philosophy. **(06 Marks)**

c. Explain the factors that make ARM instruction set suitable for embedded applications. **(06 Marks)**

OR

6 a. Explain ARM core data flow model with a neat diagram. **(08 Marks)**

b. Explain the different processor modes provided by ARM7. **(06 Marks)**

c. Discuss with a neat diagram:
i) Von Neumann architecture with cache
ii) Harvard architecture with TCM. **(06 Marks)**

Module-4

7 a. Explain with neat diagram, barrel shifter operation in ARM processor. **(08 Marks)**

b. Explain with an example the concept of semaphore using swap instruction. **(06 Marks)**

c. Develop an assembly language program to multiply two 16-bit numbers. **(06 Marks)**

OR

8 a. Explain the following with example:
i) MSR ii) MVN iii) TST iv) BIC. **(08 Marks)**

b. Explain with an example forward and backward branch. **(06 Marks)**

c. Develop an assembly language program to find GCD of two numbers using conditional execution. **(06 Marks)**

Module-5

9 a. Discuss with an example code density in thumb instruction set over ARM. **(08 Marks)**

b. Explain ARM-thumb interworking. **(06 Marks)**

c. Explain with example thumb stack operations. **(06 Marks)**

OR

10 a. Explain with an example the effect of using 'char' and 'short' as local variable types in ARM processor. **(08 Marks)**

b. List the C compiler data type mapping for an ARM target with their implementation. **(05 Marks)**

c. With an example, compare the efficiencies of signed int and unsigned int with an example. **(07 Marks)**

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21EC53

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Computer Communication Networks

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Outline the functions of various layers in TCP/IP with necessary diagram to show logical connection between layers. **(10 Marks)**

b. Compare various physical topologies in a computer network. **(10 Marks)**

OR

2 a. Explain five components of data communication with a neat diagram. **(06 Marks)**

b. Explain different types of data-flow with a neat diagram. **(06 Marks)**

c. Explain different types of switched networks used in computer network with relevant diagram. **(08 Marks)**

Module-2

3 a. Explain character-oriented framing and bit-oriented framing with an example. **(10 Marks)**

b. With a neat diagram, explain standard Ethernet frame format. **(10 Marks)**

OR

4 a. With a neat flow diagram and timing diagram, explain CSMA/CD. **(10 Marks)**

b. A pure ALOHA network transmits 200 bit frames on a shared channel of 200 kbps, what is the through put if the system produces (all stations together):
(i) 1000 frames per second
(ii) 500 frames per second
(iii) 250 frames per second **(06 Marks)**

c. Explain implementation of standard Ethernet. **(04 Marks)**

Module-3

5 a. Explain classfull addressing in detail. **(06 Marks)**

b. Explain with neat diagram, the various services provided by network layer. **(10 Marks)**

c. Explain datagram approach, with connectionless service. **(04 Marks)**

OR

6 a. Explain datagram format with neat diagram. **(10 Marks)**

b. Explain the operation of DHCP with neat diagram, also draw the FSM for the DHCP client. **(10 Marks)**

Module-4

7 a. Explain stop and wait protocol in flow diagram with neat diagram. (10 Marks)

b. Explain connectionless and connection oriented protocols in transport layer. (10 Marks)

OR

8 a. Explain Go-back-N protocol, along with sliding window diagrams. (10 Marks)

b. Explain Time-line diagram for a common scenario. (10 Marks)

Module-5

9 a. With neat diagram, explain the logical connection at the application layer. (10 Marks)

b. Explain the formats of the request and response message. (06 Marks)

c. Explain FTP with a neat diagram. (04 Marks)

OR

10 a. Explain about electronic-mail architecture. (10 Marks)

b. Explain DNS Resolution and its types: (i) recursive resolution and (ii) iteration resolution. (10 Marks)

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21EC54

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Electromagnetic Waves

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. State and explain coulomb's law of force between two point charges in vector form. **(06 Marks)**

b. Convert point P(1, 3, 5) to cylindrical and spherical co-ordinates. Also write the equations for differential surface, differential volume for rectangular, cylindrical and spherical systems. **(06 Marks)**

c. Find electric field intensity at P(1, 1, 1) caused by 4 identical 3nc charges are located at $P_1(1, 1, 0)$, $P_2(-1, 1, 0)$, $P_3(-1, -1, 0)$ and $P_4(1, -1, 0)$. **(08 Marks)**

OR

2 a. Define electric field intensity. Derive an expression for electric field intensity due to infinite line charge. **(08 Marks)**

b. A point charge of 50nc each are located at A(1, 0, 0), B(-1, 0, 0), C(0, 1, 0) and D(0, -1, 0) in free space. Find the total force on the charge at A. Also find $\overline{E}$ at A. **(06 Marks)**

c. A uniform line charge ρ_L = 25nc/m lies on the line x = -3m, y = 4m in freespace. Find electric field intensity at a point (2, 3, 15)m. **(06 Marks)**

Module-2

3 a. State and prove Gauss's law. **(06 Marks)**

b. Evaluate both sides of the divergence theorem for the defined plane in which $1 \le x \le 2$, $2 \le y \le 3$, $3 \le z \le 4$, if $\overline{D} = 4x\,\hat{a}_x + 3y^2\,\hat{a}_y + 2z^3\,\hat{a}_z\ c/m^2$. **(10 Marks)**

c. Derive the point form of continuity of current equation. **(04 Marks)**

OR

4 a. Obtain the expression for the work done in moving a point charge in an electric field. **(06 Marks)**

b. Given that the field $\overline{D} = \frac{5\sin\theta\ \cos\phi}{r}\hat{a}_r\ c/m^2$. Find : i) Volume charge density ii) The total electric flux leaving the surface of the spherical volume of radius 2m. **(08 Marks)**

c. Define potential difference. Derive the expression for potential field of a point charge. **(06 Marks)**

Module-3

5 a. State and prove uniqueness theorem. **(08 Marks)**

b. Define Stoke's theorem. Use this theorem to evaluate both sides of the theorem for the field $\overline{H} = 6xy\,\hat{a}_x - 3y^2\,\hat{a}_y$ A/m and the rectangular path around the region, $2 \le x \le 5$, $-1 \le y \le 1$ and z = 0. Let the positive direction of ds be $\hat{a}_z$. **(12 Marks)**

OR

6 a. Solve the Laplace's equation for the potential field in the homogeneous region between the two concentric conducting spheres with radii 'a' and 'b' such that b > a, if potential v = 0 at r = b and v = v_0 at r = a. Also find the capacitance between concentric spheres. **(08 Marks)**

b. Derive the expression for magnetic field intensity due to infinite long straight conductor using Biot-Savart's law. **(06 Marks)**

c. Determine whether or not the following potential fields satisfy the Laplace's equation:
i) $V = 2x^2 - 3y^2 + z^2$ ii) $V = r\cos\theta + \phi$ **(06 Marks)**

Module-4

7 a. Derive an expression for Lorentz Force equation. **(06 Marks)**

b. If $\overline{B} = 0.05x\,\hat{a}_y$ Tesla in a material for which $\pi_m = 2.5$, Find: i) μ_r ii) μ iii) $\overline{H}$ iv) $\overline{M}$ v) $\overline{J}$ vi) $\overline{J}_b$. **(08 Marks)**

c. Derive the expression for the force between two differential current elements. **(06 Marks)**

OR

8 a. Derive the expression for the boundary conditions between two magnetic medias. **(10 Marks)**

b. Calculate the magnetization in magnetic material where:
i) $\mu = 1.8 \times 10^5$ H/m and M = 120 A/m
ii) $\mu_r = 22$, there are 8.3×10^{28} Atoms/m^3 and each atom has a dipole moment of 4.5×10^{-27} A/m^2
iii) B = 300 μT and $\chi_m = 15$. **(06 Marks)**

c. Briefly explain the forces on magnetic materials. **(04 Marks)**

Module-5

9 a. List and explain Maxwell's equations in point form and integral form. **(08 Marks)**

b. Given $\overline{E} = E_m \sin(wt - \beta z)\hat{a}_y$ v/m. Find: i) $\overline{D}$ ii) $\overline{B}$ iii) $\overline{H}$. Sketch $\overline{E}$ and $\overline{H}$ at t = 0. **(08 Marks)**

c. Find the frequency at which conduction current density and displacement current density are equal in a medium with $\sigma = 2 \times 10^{-4}$ mho/m and $\epsilon_r = 81$. **(04 Marks)**

OR

10 a. State and prove Poynting theorem. **(08 Marks)**

b. For the given medium $\epsilon = 4 \times 10^{-9}$ F/m and σ = 0, find 'K' so that $\overline{E} = (20y - kt)\hat{a}_x$ v/m and $\overline{H} = (y + 2\times10^6 t)\,\hat{a}_z$ A/m. **(06 Marks)**

c. A uniform plane wave of frequency 10MHz travels in positive direction in a lossy medium with $\epsilon_r = 2.5$, $\mu_r = 4$ and $\sigma = 10^{-3}$ ℧/m. Calculate α, β, γ and η, λ. **(06 Marks)**

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21RMI56

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Research Methodology & Intellectual Property Rights

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is Engineering Research? What are the primary objectives of conducting research in engineering? **(10 Marks)**

b. What are the various types of engineering research? Explain. **(10 Marks)**

OR

2 a. Explain Fabrication, Falsification and Plagiarism related to Engineering research. **(10 Marks)**

b. What ethical considerations and responsibilities should be taken into account when determining authorship in Engineering research? **(10 Marks)**

Module-2

3 a. How do researchers distinguish between new and existing knowledge during a literature review? **(10 Marks)**

b. How can researchers effectively use search engines to find relevant literature in their fields? **(10 Marks)**

OR

4 a. What challenges do researchers commonly face when reading mathematical content or algorithm? **(10 Marks)**

b. What is impact of Title and Keywords on Citations? Explain Citation based knowledge flow. **(10 Marks)**

Module-3

5 a. What is definition of Intellectual Property (IP)? In what way does Intellectual Property contribute to economic growth and cultural development in a society? **(10 Marks)**

b. Discuss the history of Intellectual property in India. **(10 Marks)**

OR

6 a. Explain the step by step process of obtaining a patent. From the initial idea to the grant of the patent. **(10 Marks)**

b. What are the commonly used terms in the field of patenting and how do they contribute to effective communication in this domain. **(10 Marks)**

Module-4

7 a. Explain the criteria that an original work must meet to quality for copyright protection. **(10 Marks)**

b. Explain the process of copyright registration? What are the benefits for the copy right holders? **(10 Marks)**

OR

8 a. Explain the process of Trademark registration. **(10 Marks)**

b. Explain the classification system for trademarks and its role in categorizing different types of marks. **(10 Marks)**

Module-5

9 a. Explain the process of Industrial design registration. **(10 Marks)**

b. Explain the famous case law between Apple Inc Vs Samsung Electronics Co. related with Industrial Design rights. **(10 Marks)**

OR

10 a. Which specific acts, laws and rules govern geographical indications in India? Give some examples of well known geographical indications registered in India. **(10 Marks)**

b. How would you describe the overall ecosystem and significance of geographical indications in India? **(10 Marks)**

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21CIV57

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Question Paper Version : D

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan. 2024
Environmental Studies

Time: 1 hr.] [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1 GIS uses the information from which of the following sources
a) Non-Spatial Information System
b) Spatial Information System
c) Global Information System
d) Position Information System

2 EIA can be expanded as
a) Environment and Industrial Act
b) Environmental and Impact Activities
c) Environmental Impact Assessment
d) Environmental Impact Activity

3 ISO 14000 standards deals with
a) Pollution management b) Risk management
c) Environmental management d) None of these

4 Which of the following represents India in ISO
a) PFRDA b) FSSAI c) BIS d) BCCI

5 Which of the following is having high population density
a) India b) China c) USA d) Western Europe

6 Environment education is targeted to
a) General public
b) Professional social groups
c) Technical and Scientists
d) All of the above

7 Discharge of municipal waste cause
a) Depletion of dissolved oxygen
b) Destroy aquatic life
c) Impair biological activity
d) All of the above

8 _____ is are referred to a Earth's lungs
a) Forests b) Carbon cycle c) Water sources d) Miner

9 Solid waste is best managed through
a) Incineration b) Open dumping c) Sanitary landfill d) Composting

10 Love canal tragedy is attributed to
a) Soil pollution b) Hazardous waste c) Air pollution d) None of these

11 Disaster management includes _____
a) Mitigation b) Reconstruction c) Rehabilitation d) All of these

12 What is the health effects of fluoride in drinking waster
a) Arthritis b) Diarrhea c) Anemia d) All of these

13 What is the permissible range of pH for drinking water as per Indian standards
a) 6 – 9 b) 6 – 8.5 c) 6.5 – 8.5 d) 6 5 – 7.5

14 The infiltration of water into the subsurface is the
a) Influent b) Effluent c) Discharge d) Recharge

15 Environmental (Protection Act) was enacted in the year
a) 1986 b) 1992 c) 1984 d) 1974

16 What is the full form of NGO
a) Non-Governmental Organization
b) Non-Governance Organizations
c) No- Governance Organizations
d) Null – Governmental organizations

17 The primary cause of acid rain around the world is
a) CFC b) SO_2 c) CO d) O_3

18 Bhopal Gas Tragedy caused due to leakage of
a) Methyl ISO Cyanate (MIC) b) Sulphur dioxide
c) Mustered gas d) Methane

19 Deforestation can
a) Increase the rainfall
b) Increase soil fertility
c) Introduce silt in the river
d) None of the above

20 The word Environment is derived from
a) Greek b) French c) Spanish d) English

21 According to Biomedical Waste (Management and Handling) Rules 1998, waste should not be stored beyond _____
a) 12 hours b) 48 hours c) 72 hours d) 96 hours

22 Pyrolysis is an _____ process
a) Exothermic b) Endothermic c) Both a and b d) Neither a and b

23 Chloroflurocarbons are
a) Nontoxic b) Flammable c) Corrosive d) Odorous

24 Which of the following is an air pollutant
a) Carbon dioxide b) Oxygen c) Nitrogen d) Particulate matter

25 Urbanization is
a) Local environmental issue
b) Nation environmental issue
c) Both a and b
d) Not at all an issue

26 Earth day is held every year on :
a) June 5th b) November 23rd c) April 22nd d) January 26th

27 The term hotspot was introduced by –
a) Norman Myere b) Jacob Von Verkul
c) A.G. Transley d) Ernst Haeckel

28 In an Ecosyste, the energy flow is always
a) Always unidirectional
b) Always bidirectional
c) In any direction
d) Always down directional

29 Which of the following is considered as an alternate fuel
a) CNG b) Kerosene c) Coal d) Petrol

30 Nuclear power plant in Karnataka is located at
a) Bhadravati b) Sandur c) Raichur d) Kaiga

31 The main cause of damage to Taj Mahal is _____
a) Water pollution b) Soil pollution c) Acid rain d) Fog

32 Reducing the amount of future climate change is called.
a) Mitigation b) Geo-engineering c) Adaptation d) None of these

33 Ozone layer is at a height of _____ above the Earth's surface
a) 19 to 48m b) 19 to 480m c) 19 to 48km d) 190 to 480km

34 Which ministry is mainly responsible for research and development in renewable energy sources such as wind, power small hydro, biogas and solar power
a) Human Resource Development
b) Agriculture and Famous welfare
c) Ministry of new and Renewable energy
d) Health and Family welfare

35 The OTEC is an energy technology that converts
a) Energy in large fides of ocean to generate electricity
b) Energy in ocean waves to generate electricity
c) Energy in ocean due to thermal gradient to generate electricity
d) Energy in the fast moving ocean currents to generate electricity

36 In a Lake, phytoplankton grow in abundance in
a) Littoral zone b) Limnetic zone c) Profundal zone d) Benthic region

37 The prescribed limits of noise in residential area during day is
a) 55dB b) 45dB c) 60dB d) 50dB

38 The maximum allowable concentration of fluorides in drinking water
a) 3mg/L b) 2mg/L c) 2.5mg/L d) 1.5mg/L

39 The color code of plastic bag for disposing microbial laboratory culture waste
a) Red b) Black c) Blue d) White

40 The hazardous pollutant released from batteries is
a) Arsenic b) Cobalt c) Barium d) Cadmium

41 Biodiversity is a measure of variation at the _____ level
a) Genetic b) Species c) Ecosystem d) All of these

42 World Environment Day is celebrated on _____
a) 5th May b) 5th June c) 18th June d) 16th August

43 Mining means
a) To conserve minerals b) To check pollution
c) To extract minerals and ores d) None of these

44 Direct conversion of solar energy is attained by
a) Solar Photo volcanic system
b) Solar diesel hybrid system
c) Solar thermal system
d) Solar air heater

45 What % of its geographical area of a country should be under forest cover
a) 23% b) 43% c) 13% d) 33%

46 Hazardous Waste Management Act was enacted in India in the year
a) 1988 b) 1989 c) 1990 d) 1991

47 Which of these following elements is the case of e-waste?
a) Cadmium b) Beryllium c) Lead d) All of these

48 Remote sensing techniques make use of the properties of _____emitted, reflected or diffracted by the sensed objects
a) Electric waves b) Sound waves
c) Electromagnetic waves d) Wind waves

49 The altitudinal distance of a geostationary satellite from the earth is about
a) 26,000km b) 30,000km c) 36,000km d) 44,000km

50 Montreal protocol is related to the
a) Food security b) Global warming
c) Sustainable development d) Ozone layer depletion

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