Full Marks: 70   Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions   5x2=10

1. Define 'Traditional Knowledge (TK)'.   2

2. Write down few Traditional Knowledge system-based practices.   2

3. Categorize Traditional Knowledge based on its nature and types.   2

4. Differentiate between western knowledge and indigenous knowledge.   2

5. Describe different aspects of TK.   2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions   4x15=60

6. (i) Why should we protect Traditional Knowledge?   5
   (ii) Why do you think environmental, social, and economic sustainability are related to TK system?   5
   (iii) How is Traditional Knowledge protected in India?   5

7. (i) Write a short note on various factors affecting the transmission, preservation, and protection of TK.   5
   (ii) Briefly state the abuses of TK.   5
   (iii) Explain OCAP in detail.   5

8. (i) Why was TKDL set up?   5
   (ii) What are the goals of TKDL?   5
   (iii) Name various international organizations that can access TKDL?   5

9. (i) What is bio-piracy?   5
   (ii) How does it happen?   5
   (iii) Is bio-piracy illegal? explain.   5

10. (i) Why there is a need to stop bio-piracy?   5
    (ii) Elaborate the various actions taken against bio-piracy?   5
    (iii) Why companies choose Bio-piracy instead of Bio-prospecting?   5

11. (i) Write a short note on "Convention on Biodiversity (CBD)".   5
    (ii) Write a short note on "Bio prospecting Contracts".   5
    (iii) Write a short note on "Patent Law".   5

12. (i) Write down the key features of "Biological Diversity Act, 2002".   5
    (ii) Write down the key features of "Geographical Indication Act, 2003".   5
    (iii) Write down the key features of "Protection of Plant Varieties and Farmers' Rights Act, 2001".   5

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/EE/HMHU(EE) 401 /2022-23
2023
PAPER NAME: Values & Ethics in Profession

Full Marks: 70   Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions   5x2=10

1.	What is whistle blowing ?	2
2.	What is good life ?	2
3.	What is Ethics ?	2
4.	Who said that 'Knowledge is a power'?	2
5.	What is kinesics ?	2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions   4x15=60

6. Explain the concept value crisis in contemporary society ?   15

7. What is aesthetic values ? Explain the areas of aesthetic values ?   5+10

8. What are the factors to be considered in making Ethical judgment ?   15

9. What is Environmental degradation ? What are the types of Environmental degradation ? As a student   4+6+5
of Engineering how you can solve this problem?

10. Explain the concept of mental health and social values ?   8+7

11. Explain the nature of values ?   15

12. Write a short note on psychological values and integrated personality ?   7+8

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JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ EE/ ES-ME(EE)-401/ 2022-23
2023
THERMAL POWER ENGINEERING

Full Marks: 70   Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions   5x2=10

1. Distinguish between internal combustion engine and external combustion engine?
2. What is knocking of a CI engine?
3. What is natural circulation boiler?
4. Draw and explain Rankine cycle by TS diagram?
5. What is supersonic nozzle?

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions   4x15 = 60

6. i) How does Fluidized bed furnace work? Describe briefly with neat sketch.   10
   ii) Mention the advantage and disadvantages of a Fluidized bed furnace   5

7. i) Derive the expression of cycle thermal efficiency of a diesel Cycle.   6
   ii) In a S.I. engine working on the ideal Otto cycle, the compression ratio is 5.5. The pressure and   9
   temperature at the beginning of compression are 1 bar and 27°C. The peak pressure is 30 bar. Determine
   the pressure and temperature at the salient points, the air-standard efficiency and the mean effective
   pressure. Assume ratio of specific heats to be 1.4.

8. i) Derive the expression for critical pressure ratio and critical temperature ratio for flow of steam along   10
   convergent divergent nozzle.
   i) What do you mean by choked flow for convergent divergent nozzle?   5

9. i) Describe briefly the working principle of Cyclone separator with neat sketch   7
   ii) Describe briefly the working principle of different types of bag-houses   8

10. i) Draw the schematic diagram and describe the working principle of fire tube boiler.   10
    ii) What are forced draught fan and induced draught fan?   5

11. Write short notes on   3×5

    i) Air preheater
    ii) Evaporator tube
    iii) Economizer

Full Marks: 70   Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions   5×2=10

1. What do you understand by 'divergence' of a vector? Mention physical interpretation of it.

2. Obtain Poisson's equation. When it reduces to Laplace's one?

3. Show that, static electric intensity is conservative field.

4. Prove that $\nabla \times \bar{H} = \bar{J}$ for non-time varying field.

5. Write down two differences between 'conduction current density' and 'displacement current density.'

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions   4×15 = 60

6.
   i. State Coulomb's law in vector form.   2

   ii. Find the force on a point charge of $50\mu C$ at $(0,0,5)$ m due to a charge of $500\pi \ \mu C$, that is uniformly distributed over the circular disk $r \leq 5$ m, on the $Z = 0$ plane.   5

   iii. Derive the $\bar{E}$ field due to an infinite sheet of charge, with uniform charge density ρ_s C / m² which lies on the $Z = 0$ plane.   6

   iv. Charge is distributed uniformly over the infinite plane at $Z = 10 \ cm$, with a density $\rho_S = \frac{1}{3\pi}$ nC/m². Find $\bar{E}$.   2

7.
   i. Determine the flux of $\bar{D} = \rho^2 \cos^2\phi \ \hat{a}_\rho + Z\sin\phi \ \hat{a}_\phi$, over the closed surface of the cylinder $0 \leq Z \leq 1$ and $\rho = 4$. Verify the divergence theorem for this case.   3+4

   ii. Show that ρ_v is zero everywhere except at the origin, for a point charge Q located at the origin, of the spherical coordinate system.   5

   iii. Given the potential field, $V = 2X^2Y - 5Z$. Determine the electric flux density $\bar{D}$ at P $(-4,3,6)$.   3

8.
   i. Deduce the expression of 'relaxation time' and hence find the value of it for mica . Given that $\sigma_{mica} = 10^{-15}$ s/m and $\epsilon_r = 6$..   3+2

   ii. Mention two important properties of good conductor.   2

   iii. Derive the expression of 'energy density' in an electrostatic field.   8

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/EE/Sem-4/PC-EE403/2022-23
2023
POWER ELECTRONICS

Times: 3 Hours

Full Marks: 70

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

5×2=10

Answer *all* questions

1. What are the constructional modifications made in diodes to make them suitable for high power applications?
2. What are the conditions for a thyristor to conduct?
3. What characteristic of UJT has made it suitable to design firing circuits for SCR?
4. What is the use of commutation circuits for SCR?
5. Why feedback diodes are used in anti-parallel with power switches in inverters?

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

4×15 = 60

Answer any *four* questions

6. i) Discuss the following terms for diodes: Softness factor, PIV, Reverse recovery time, Reverse recovery current. — 4
   ii) What are the types of power diodes? — 3
   iii) A three-phase bridge rectifier has a purely resistive load of R. Showing associated waveforms, derive the expressions of average and rms of output voltage. — 8
   Also determine: (a) Rectification efficiency, (b) Form Factor (FF), (c) TUF.

7. i) Define latching and holding currents as applicable to an SCR. Show these currents on its static I-V characteristics. — 4
   ii) With the help of two transistors model, explain how a small gate current can initiate turn-on mechanism in SCR. — 5
   iii) A thyristor operating from a peak supply voltage of 400 volt has the following specification. Repetitive peak current I_p =200 A, [di/dt] max = 50 A/μs , [dv/dt] max = 200 V/μs. Choosing a factor of safety of 2 for I_p, [di/dt] max, [dv/dt] max, design a suitable snubber circuit. — 6

8. i) Draw the R-C firing circuit for SCR and explain with proper waveforms. — 5
   ii) A relaxation oscillator using an UJT is to be designed for triggering an SCR. The UJT has the following data: η = 0.72, I_p = 0.6 mA , V_p = 18.0 V, V_v = 1.0 V, I_v = 2.5 mA, R_{BB} = 5 kOhm , Normal leakage current with emitter open = 4.2 mA. Firing frequency is 2 kHz. For c=0.04μF, compute the values of three resistances (R, R1 and R2). — 6
   iii) Why semi-converter is single quadrant whereas full-converter is two quadrant converter? — 4

9. i) What is the purpose of freewheeling diodes connected in rectifier circuits with R-L load? — 4
   ii) Describe the effect of source inductance on the dc output voltage of a single phase full controlled bridge rectifier. — 6
   iii) Mention the advantage and disadvantage of circulating current scheme in a dual converter. — 5

10. i) Describe the principle of step-up operation of DC-Chopper. — 4
    ii) The buck regulator in has an input voltage of V_s = 12 V. The required average output voltage is V_a = 5 V and the peak-to-peak output ripple voltage is 20 mV. The switching frequency is 25 kHz. If the peak-to-peak ripple current of inductor is limited to 0.8A, determine (a) the duty — 6+5

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ EE/ PC-EE-401/ 2022-23
2023
Digital Electronic Circuits

Full Marks: 70   Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all the* questions: 5x2=10

1. Convert i) $(110101)_G$ to Binary Code ii) $(1011011)_B$ to Gray Code.   2
2. Simplify the Boolean expression: $y(w\bar{z}+wz)+xy$ 2
3. What is Strobe? Why it is required in Multiplexer?   2
4. Simplify the following expression by using De Morgan's theorem: complement of $[(A+B)\ \overline{CD}+E+\overline{F}]$ 2
5. What is Race condition of flip flop?   2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *Four* questions: 15x4 = 60

6. i) What is universal gate & why they are called so. Prove the above statement for X-OR & X-NOR gates.   5

    ii) The Boolean function given as $F=\overline{A}\overline{B}C\overline{D}+\overline{A}BC\overline{D}+A\overline{B}C\overline{D}+\overline{A}B\overline{C}D$, implement it with only X- OR & AND gate.   3

    iii) Show that, odd Parity checker is the complement of even parity checker, where n=3 are the three input variables bit of the transmitted signals.   5

    iv) Using 2's complement perform the subtraction (11010-1101)   2

7. i) Show that a +ve logic AND gate is a -ve logic OR gate & vice versa.   2

    ii) What is Propagation delay time of digital circuit?   4

    iii) Simplify the Boolean function by using K-Map technique $F(w,x,y,z)=\Sigma m(1,3,7,11,15)\ \&\ d(w,x,y,z)=\Sigma m(0,2,5)$ 2

    iv) Show that, $A \oplus B \oplus C \oplus D = \Sigma (0,3,5,6,9,10,12,15)$ 5

8. i) If any of the n-bit decoded information has unused or don't care condition, the decoder output will have less than 2^n output. Prove the above statement in case of Full Adder circuit.   6

    ii) Design a 16:1 MUX by using Four 4:1 MUX and explain its operation.   9

9. i) With the help of K-Map technique design the circuit of a four input Priority Encoder.   9

    ii) Implement the following function with a multiplexer $F(A,B,C,D)=\Sigma(0,1,3,4,8,9,15)$, taking LSB=D as input.   6

10. i) Show how a S-R flip flop can be converted into a D flip flop.   5

    ii) What is synchronous counter? Draw the circuit diagram of a MOD-6 unit distance code counter with the help of excitation map for MOD-6 unit distance code counter using D flip flop.   1+5

    iii) Write short note on propagation delay in ripple counter.   4

11. i) What is shift register? Explain the working of serial in parallel out shift register with logic diagram & waveform.   1+5

    ii) Write a short note on Programmable Logic Array (PLA).   4

    iii) Explain the successive approximation technique of A/D converter.   5

ELECTRICAL MACHINE-II

Times: 3 Hours

Full Marks: 70

The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

5x2=10

Answer *all* questions

1. Can a 3-ph Induction Motor run at Synchronous Speed? Justify your answer.

2. Which is better method of starting of Slip Ring Induction Motor, adding resistances to Rotor Winding or adding resistances to Stator Winding? Justify your answer.

3. Whether an Alternator supplying power to an inductive load to be over-excited or under-excited? Justify your answer.

4. Can a salient pole Synchronous Motor run at synchronous speed if its excitation fails suddenly while running? Justify your answer.

5. Is the Single Phase Induction Motor Self starting? Justify your answer.

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

12x5 =60

Answer any *five* questions

6. (a) Why is the starting current of 3-ph Induction Motor higher than that of full load current?   2

   (b) For a 3-ph Induction Motor, maximum torque is twice the full load torque and starting torque is 1.6 times the full load torque. In order to get a full load slip of 5%, calculate the percentage reduction in rotor circuit resistance. Neglect stator impedance.   7

   (c) Why is the Maximum Torque of a 3-ph Induction Motor independent of rotor resistance?   3

7. (a) Why is a 3-ph Induction motor started with stator windings connected in star but run with those connected in delta?   2

   (b) The rotor of a 3-ph Induction Motor has 0.04Ω resistance per phase and 0.2Ω standstill reactance per phase. What external resistance is required in the rotor circuit in order to get half of maximum torque at starting? Neglect stator impedance. By what percent this external resistance change the current and power factor at starting?   8

   (c) Determine the harmonic slip of 3-ph Induction motor for 5th time harmonic.   2

8. (a) Draw the slip-torque characteristics of 3-phase induction motor. Mark the stable and unstable region.   2

   (b) A 3-ph Induction Motor has a starting torque of 150% and a maximum torque of 250% of the full load torque. Neglect the stator resistance and assume constant rotor resistance. Compute   8
    (i) The slip at maximum torque
    (ii) Full load slip
    (iii) The rotor current at starting in terms of full load rotor current.

   (c) What are the advantages of V/f Method of speed control of 3-ph Induction Motor?   2

9. (a) Explain Double Revolving Field Theory as applicable to single phase induction motor. What are   5

9.   i. State and explain Biot-Savart law.   3

ii. Apply Biot-Savart law to find out H field due to an infinitely long straight filament carrying a   6
direct current I and extending along Z-axis.

iii. Derive the expression of 'vector magnetic potential' and mention application field of it.   5+1

10.   i. Establish the relation , $(\bar{J} = \sigma\bar{E} + \frac{\delta\bar{D}}{\delta t})$, for time varying field and hence explain the   5+3
significance of the term $\frac{\delta\bar{D}}{\delta t}$.

ii. In view of above, obtain the modified form of Ampere's Circuital Law for time varying field.   2

iii. A circular cross-section conductor of radius 1.5 mm carries a current
$i_c = 5.5 \sin(4 \times 10^{10}t)\,\mu A$.
What is the amplitude of the displacement current density, if $\sigma = 35$ MS/m   and $\epsilon_r = 1$.   5

11.   i. Write short notes on any three :   (3x5)

     i. Helmholtz's theorem

     ii. Lorentz's force equation

     iii. Maxwell's equations

     iv. Propagation constant

cycle, (b) the filter inductance, and (c) the filter capacitor. Derive necessary expressions with associated circuits and waveforms.

11. i) Describe the operation of a three phase voltage source inverter with 120° conduction mode delivering   6
power to a star connected purely resistive load.
ii) Compare 180° and 120° conduction modes of 3 phase bridge inverter.   4
iii) What is PWM inverter? What is advantage of PWM inverter over VSI?   2+3

12.   Write short notes on any *three*:   3×5 =15

  i) ON-OFF type single phase AC controller
  ii) UJT based Ramp firing circuit for SCR
  iii) Gate – Cathode characteristics of SCR
  iv) SCR Gate protection circuit
  v) DC Buck-Boost Regulator

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