1. The main function of the moderator in a reactor is

A) to slow down the fast neutrons

C) to prevent neutrons to produce fission

B) to absorb dangerous gamma rays

,our

D) to release enough energy.

Ans: (A)

Neutron moderators are a type of material in a nuclear reactor that work to slow down the fast neutrons (produced by splitting atoms in fissile compounds like uranium-235), to make them more effective in the fission chain reaction. This slowing or moderation of the neutrons allows them to be more easily absorbed by fissile nuclei, creating more fission events

Types of moderating materials

There are several different types of moderating materials, and each have places where they are used more effectively. Typically-used moderator materials include heavy water, light water, and graphite. The relative properties of these materials are compared below. The moderators vary in terms of their moderating abilities, as well as in their costs.

https://energyeducation.ca/encyclopedia/Neutron_moderator#:~:text=Neutron%20moderators %20are%20a%20type,in%20the%20fission%20chain%20reaction&text=Thus%2C%20in%20an%20ideal%20moderator,scattering%20cross%2Dsection%20id%20high.

What is Moderator?

Natural uranium consists of a mixture of various isotopes, primarily ²³⁸U and a much smaller amount (about 0.72% by weight) of ²³⁵U. ²³⁸U can only be fissioned by neutrons that are relatively energetic, about 1 MeV or above. No amount of ²³⁸U can be made "critical" since it will tend to parasitically absorb more neutrons than it releases by the fission process. ²³⁵U, on the other hand, can support a self-sustained chain reaction, but due to the low natural abundance of ²³⁵U, natural uranium cannot achieve criticality by itself.

The key to maintaining a nuclear chain reaction within a nuclear reactor is to use, on average, **exactly** one of the neutrons released from each nuclear fission event to stimulate another nuclear fission event (in another fissionable nucleus). With careful design of the reactor's geometry, and careful control of the substances present so as to influence the reactivity, a self-sustaining chain reaction or "criticality" can be achieved and maintained.

Moderator is required in a Nuclear reactor to slow down the neutrons produced during the fission reaction so that the chain reaction can be sustained. Heavy Water is an excellent moderator due to its high moderating ratio and low absorption cross section for neutrons. Heavy water is used as a moderator in some reactors because it slows down neutrons effectively and also has a low probability of absorption of neutrons.

Heavy Water (D_2O) or deuterium oxide is made up of two atoms of deuterium and one atom of oxygen. Deuterium is a stable isotope of hydrogen with double the mass of hydrogen due to presence of an extra neutron in its nucleus.

https://www.hwb.gov.in/frequently-asked-questions-faqs https://www.nrc.gov/reading-rm/basic-ref/glossary/heavy-water-d2o.html

2. The main characteristic of any diode is –

A) It lets current flow in only one direction

B) Most current flows when it is reverse biased

C) No current flow when it is forward biased

D) it lets current flow from cathode to anode.

Ans:A. Diode is unidirectional device that allows the flow of current in one direction only depending on the biasing.

Diode, an electrical component that allows the flow of current in only one direction. In circuit diagrams, a diode is represented by a triangle with a line across one vertex.

These diodes begin conducting electricity only if a certain threshold voltage is present in the forward direction (i.e. the "low resistance" direction). The diode is said to be "*forward biased*" when conducting current in this direction. When connected within a circuit in the reverse direction (i.e. the "high resistance" direction), the diode is said to be "*reverse biased*".

The most common type of diode uses a p-n junction. In this type of diode, one material (n) in which electrons are charge carriers abuts a second material (p) in which holes (places depleted of electrons that act as positively charged particles) act as charge carriers. At their interface, a depletion region is formed across which electrons diffuse to fill holes in the p-side. This stops the further flow of electrons. When this junction is forward biased (that is, a positive voltage is applied to the p-side), electrons can easily move across the junction to fill the holes, and a current flows through the diode. When the junction is reverse biased (that is, a negative voltage is applied to the p-side), the depletion region widens and electrons cannot easily move across. The current remains very small until a certain voltage (the breakdown voltage) is reached and the current suddenly increases.

Light-emitting diodes (LEDs) are p-n junctions that emit light when a current flows through them. Several p-n junction diodes can be connected in series to make a rectifier (an electrical component that converts alternating current to direct current).

Zener diodes have a well-defined breakdown voltage, so that current flows in the reverse direction at that voltage and a constant voltage can be maintained despite fluctuations in voltage or current.

In varactor (or varicap) diodes, varying the bias voltage causes a variation in the diode's capacitance; these diodes have many applications for signal transmission and are used throughout the radio and television industries.

Britannica, The Editors of Encyclopaedia. "Diode". *Encyclopedia Britannica*, 5 Mar. 2018, https://www.britannica.com/technology/diode. Accessed 8 September 2021.



Ans:(D)

Note: A **thyristor** is a four-layer device with alternating P-type and N-type semiconductors (P-N-P-N). In its most basic form, a thyristor has three terminals: anode (positive terminal), cathode (negative terminal), and gate (control terminal). The gate controls the flow of current Peramour between the anode and cathode. Diode is a semiconductor device/unidirectional device that allows the flow of current in one direction only depending on the biasing. A transformer step –up or step-down AC votage. 4. The nature of charge of neutron is: A) positive B) Negative D) Sometimes positive and sometimes negative C) No charge Ans:(D) 5. Who was the first man to step in space? B) Edmund Hillary D) Yuri Gagarin. A) Neil Armstrong ng Norgay Ans:(A) 6. Electronic components are mostly fixed to the circuit board by C) soldered A) welded D) Noneof these. Ans:(C) An electronic component is any basic discrete device or physical entity in an electronic system used to affect electrons or their associated fields. Electronic components are mostly industrial products, available in a singular form and are not to be confused with electrical elements, which are conceptual abstractions representing idealized electronic components. Electronic components have a number of electrical terminals or leads. These leads connect to other electrical components, often over wire, to create an electronic circuit with a particular function (for example an amplifier, radio receiver, or oscillator). Basic electronic components may be packaged discretely, as arrays or networks of like components, or integrated inside of packages such as semiconductor integrated circuits, hybrid integrated circuits, or thick film devices. The following list of electronic components focuses on the discrete version of these components, treating such packages as components in their own right. Classification Components can be classified as passive, active, or electromechanic. Active components rely on a source of energy (usually from the DC circuit, which we have chosen to ignore) and usually can inject power into a circuit, though this is not part of the definition.^[1] Active components include amplifying components such as transistors, triode vacuum tubes (valves), and tunnel diodes.

• Passive components cannot introduce net energy into the circuit. They also cannot rely on a source of power, except for what is available from the (AC) circuit they are connected to. As a consequence they cannot amplify (increase the power of a signal), although they may increase a voltage or current (such as is done by a transformer or resonant circuit). Passive components include two-terminal components such as resistors, capacitors, inductors, and transformers.
Electromechanical components can carry out electrical operations by using moving parts or by using electrical connections
Most passive components with more than two terminals can be described in terms of two-port parameters that satisfy the principle of reciprocity—though there are rare exceptions. ^[2] In contrast, active components (with more than two terminals) generally lack that property.
https://en.wikipedia.org/wiki/Electronic_component
7. White clothes are preferable in summer because:
(1) they are cheaper (2) they do not absorb sun rays
(3) it is comfortable to wear (4) they reduce the body temperature
Ans:(2)
8. Flying aeroplane posses
 (1) Kinetic energy + Potential energy (2) Kinetic energy (3) Potential energy (4) None of these
Ans:(1)
9. Choose the wrong combination
 Planet nearest to the sun Most abundant gas in the atmosphere - Oxygen Aluminium ore - Bauxite Normal body temperature of human beings - 37° C
Ans:2
Note: (N ₂ is the right answer)
0. Choose the wrong statement with the Event and the year mentioned
(1) 1950 - India became Republic (2) 1942 - Orit India became republic
(2) 1942 - Quit India Movement $(3) 1880 - INC formed$
 (4) 1857 - First War of Indian Independence Ans:3

		Note: (INC was for	med in 1885)					
	11.	Instruments and the	ir uses are given b	below. C	hoose the wro	ng statement		
		(1) Baro (2) Ther (3) Tach (4) Steth Ans:4	ometer mocouple nometer noscope	- - -	Pressure Temperature rpm Eyesight		~	(10 ¹⁾
	Note:	(Stethoscope is used)	by doctors to jude	ze the he	eart beat)		<u> </u>	•
	12.	One micron is	<u> </u>	<u> </u>	,	•	66.	
		(1) 0.001 mm (2) 0	.1 mm	(3) 0.0	1 mm	(4) 0.0001 m	m	
	[Ans:1				X		
		Note: (10 ° m)			20			
	13.	Unit of measuremen	t of noise is					
		(1) Lux	(2) Decibel	0	(3) Kilowatt		(4) Amper	
		Alls:2						
	Note: of a b anothe	The decibel (symbol el (B). It is used to e er, on a logarithmic so	: dB) is a relativ xpress the ratio of cale. A logarithm	e unit o of one v nic quan	f measuremen value of a pow tity in decibel	t correspondin er or root-pow s is called a lev	g to one tenth ver quantity to vel	
	14.	The weight of a bod	y js	*				
		(1) Same everywhen(3) Maximum at the	e on earth equator		(2) Maximum (4) More on t	n at the poles he hills than in	the plains	
		Ans:2						
	Note:	since earth radius	is minim at pole	by 21 k	m)			
•.7	15.	A person weighs mo	ore in a lift, which	n is				
$C_{C_{I}}$		(1) Moving up with(3) Accelerating upv	constant velocity ward		(2) Moving de(4) Acceleration	own with const ing downward	tant velocity	
ソ		Ans:3						
	16.	When the velocity o	f a body is double	ed its				

(1) Acceleration is doubled(3) Kinetic energy is doubled

(2) Momentum is doubled

(4) Potential energy is doubled



Note: radiography of the brain after the cerebrospinal fluid has been replaced by a gas (as air)

Electroencephalography (**EEG**) is an electrophysiological monitoring method to record electrical activity of the brain. It is typically noninvasive, with the electrodes placed along the scalp, although invasive electrodes are sometimes used, as in electrocorticography, sometimes called intracranial EEG. EEG used to be a first-line method of diagnosis for tumors, stroke and other focal brain disorders,^{[3][4]} but this use has decreased with the advent of high-resolution anatomical imaging techniques such as magnetic resonance imaging (MRI) and computed tomography (CT). Despite limited spatial resolution, EEG continues to be a valuable tool for research and diagnosis. It is one of the few mobile techniques available and offers millisecond-range temporal resolution which is not possible with CT, PET or MRI

https://en.wikipedia.org/wiki/Electroencephalography

20. Solar cells are basically :

(1)	photodiodes	(2)	LED
(3)	photovoltaic cell	(4)	photo transistors

Ans:3 Note: A solar cell (also known as a photovoltaic cell or PV cell) is defined as an electrical device that converts light energy into electrical energy through the photovoltaic effect A solar cell is basically a p-n junction diode. or A solar cell, or photovoltaic cell, is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, 21. The largest planet in the solar system is 3. Venus 4. Pluto 2. Jupiter 1. Mars Ans:2 for its offset printing/manufacture of 22. Name the place in Tamil Nadu that is famous crackers industry 3. Kovilpatti 1. Karaikudi 4. Coimbatore Ans: 2 23. Which is the common meth cooling a power transformer? 1. Air-cooling 2. Air-blast cooling 3. Oil-coo 4. Natural cooling Ans: 3 COOLING SFORMER AND METHODS OF COOLING

Cooling of Transformer is the process by which heat generated in the transformer is dissipated or treated to the safe value. This is achieved by various cooling methods of transformer available.

The major factor for the generation of heat in the transformer is the various losses like hysteresis, eddy current, iron, and copper loss. Among all the various losses the major contributor of the heat generation is the **copper loss** or I^2R loss. If the temperature of the transformer will continue to increase rapidly, it will result in the degradation of the insulation used in the transformer resulting in the damaging of the various parts and hence the failure of the transformer. Thus, proper removal or treatment of heat is necessary for the efficient working, longer life and higher efficiency of the

transformer.

The various coolants used for the cooling purpose of the transformer are air, synthetic oils, mineral oils, gas, water.

Basically, there are **two types of transformer** one is the **dry type**, and another one is oilimmersed **type**.

https://circuitglobe.com/cooling-of-transfomer-and-methods-ofooling.html#:~:text=By%20Air%20Natural%20method%20the,replaced%20by%20the%00cool%20air.

HOW TO COOL THE TRANSFORMER?

There are two ways of cooling the transformer:

First, the coolant circulating inside the transformer transfers the heat from the windings and the core entirely to the tank walls and then it is dissipated to the surrounding medium Second, along with the first technique, the heat can also be transferred by coolants inside the

transformer.

The choice of method used depends on the size, type of applications and the working conditions.

COOLANTS

The coolants used in the transformer are air and oil. In dry type transformer air coolant is used and in oil immersed one, oil is user. In the first said, the heat generated is conducted across the core and windings and is dissipated from the outer surface of the core and windings to the surrounding air. In the next, heat is transferred to the oil surrounding the core and windings and it is conducted to the walls of the transformer tank. Finally the heat is transferred to the surround air by radiation and convection.

METHODS OF COOLING OF TRANSFORMER

Based on the coolant used the cooling methods can be classified into:

Soci

Air cooling Oil and Air cooling Oil and Water cooling 1. Air cooling (Dry type

https://owlcation.com/stem/Cooling-of-transformers

	24.	In SI units, Youn	g's Modulus is exp	ressed in:		
		(1)Pascal	(2) Bars	(3) Newtons	(4) None of the above.	
		Ans: 1				5
	25.	Alternator generat	esvolatge			
		1. D.C.		2. A.C.	50	
		3. D.C. and A.C	both	4. Pulsating I	D.C	
		Ans: 2			<u> </u>	
	26.	Avogadro number	N is a –			
		 Constant at con Constant at con Const ant at cor Universal const Ans: 4 	stant temperature. stant pressure nstant volume ant.	, Educ		
	Note its n be e char	: Avogadro's numb nolecular weight i lectrons, atoms, ior racter of the reaction	er, number of un in grams), equal ns, or molecules, do n (if any)	hits in one mole of a to $6.02214076 \times$ epending on the natur	my substance (defined as 10^{23} . The units may e of the substance and the	
	27.	Copper loss in a tr	ansformer is that p	ower loss caused by –		
		(1)eddy current(3) resistance of c	onductors	(2) magnetic field rev (4)counter EMF.	zersal	
	Note	Connor loss is the	term used to descr	ibe the energy dissingt	ad by resistance in the wire	7
	used	to wind a coil.		the the energy dissipat		
	28.	Which componen petrol engine?	t among the follow	ing reduces noise of ex	chaust gases in a	
i))`	(1) Exhaust pipe	(2) muffler	(3) inlet mani	fold (4) tail pipe.	
202		Ans: 2				
	29.	The domestic refr	igerator works on tl	he principle of –		
		1. Vapour absorpt	ion refrigeration sy	stem		

2. Vapour compression refrigeration system

Liquid gas refrigeration system
 Thermo-electric refrigeration system
 Ans: 2

30. In a lead acid cell/battery, the electrolyte used is:

(1) Dilute Sulphuric acid(3) Hydrochloric acid

(2) Nitric acid(4) None of the above.

Recamply

Ans: 1

- 31. A commutator is provided in a DC generator:
 - (1) To convert induced alternating voltage in unidirectional pulse.
 - (2) To boost output voltage
 - (3) To prevent sparking
 - (4) None of the above.

Ans: 1. Thecommutator on the DC generator converts the AC into pulsating DC.

Fundamental Concepts: Motors George Patrick Shultz, in Transformers and Motor

Commutator and Brushes

Commutators and brushes are used on all DC generators and DC motors. They are also used on some AC motors such as the repulsion synchronous, and universal motors. All generators produce a sine wave for AC currents when the rotor turns in the magnetic field. The commutator on the DC generator converts the AC into pulsating DC. The commutator assures that the current from the generator always flows in one direction. The brushes ride on the commutator and make good electrical connections between the generator and the load.

On DC and most AC motors the purpose of the commutator is to insure that the current flowing through the rotor windings is always in the same direction, and the proper coil on the rotor is energized in respect to the field coils



. Parts of the commutator.

The segments of the commutator are usually made of copper and are separated from each other by mica insulation. The mica is cut so that it lies below the copper segments. Slots are cut in the riser on the commutator to facilitate the soldering of the ends of the coils. There are twice the number of segments on the commutator as there are slots in the laminated core for the coils.

Pressed against the commutator and held by spring tension are the brushes. Brushes are usually made of a graphite substance which is softer than the copper segments. Brush wear will, therefore, be greater than that of the commutator, and they will need to be replaced more often.

MOTORS AND ACTUATORS

MG Say PhD, MSc, CEng, FRSE, FIERE, AGCI, DIC, JF Eastham, in Electrical Engineer's Reference Book (Sixteenth Edition), 2003

Note: Commutators are used in direct current (DC) machines: dynamos (DC generators) and many DC motors as well as universal motors. In a motor the commutator applies electric current to the windings. By reversing the current direction in the rotating windings each half turn, a steady rotating force (torque) is produced.

In a generator the commutator picks off the current generated in the windings, reversing the direction of the current with each half turn, serving as a mechanical rectifier to convert the alternating current from the windings to unidirectional direct current in the external load circuit.

https://en.wikipedia.org/wiki/Commutator_(electric)#:~:text=In%20a%20generator%20th e%20commutator,in%20the%20cxternal%20load%20circuit.

- 32. Identify the type of motor recommended for locomotive drive
 - (1) D.C.series motor(3) D.C.shunt motor

(2) D.C. Compound motor(4)Synchronour motor

NOUT

33. Laminated cores are used to reduce:

ysteresis loss (2) Copper loss (2

(3) Eddy current loss (4) Iron loss

Ans: 3

Ans: 1

Note: The transformer **core** needs to be **laminated** to **reduce** the eddy current that has arisen from the induced voltages through the **core**, thereby **reducing** the heat loss of the entire **core**.

34. A man pulls a car mass 150 kg. and produces an acceleration of $4m/sec^2$. Find the force exerted by the man –

	(1) 600 N (2) 600 Dynes (3) 150 N (4) 150 Dynes .	
	Ans:1	
35.	The Ratio of load lifted to effort applied is known as –	
	 (1) Velocity ratio (2) Efficiency (3) Mechanical advantage (4) Factor of safety. 	s?
	Ans: 3	10)
36.	What is the voltage of an electrical circuit with 3 ampere current an resistance?	.d 60 ohm
	(1) 20 volt (2) 180 volt (3) 30 volt (4) 90 volt	
	Ans:2	
37.	ECG is used for the diagnosis of ailments of	
	(1) Brain (2)Heart (3)Kidneys (4) Stor	mach.
	Ans: 2	
Note heart or de	e: An electrocardiogram is a painless, noninvasive way to help diagnose man et problems in people of all ages. Your doctor may use an electrocardiogram to etect:	ny commo o determin
•	Abnormal heart rhythm (arrhythmias)	
• chest	If blocked or narrowed arteries in your heart (coronary artery disease) st pain or a heart attack	are causin
•	Whether you have had a previous heart attack	
•	How well certain heart disease treatments, such as a pacemaker, are working	ıg
You	may need an ECG if you have any of the following signs and symptoms:	
• (Chest pain	
• [Dizziness, lightheadedness or confusion	
	Heart palpitations	
• H		
• E	Rapid pulse	
• H • F • S	Rapid pulse Shortness of breath	

One micron is equ	ual to		
(1) 0.1 mm	(2) 0.01 mm	(3) 0.001 mm	(4) 0.0001 mm
Ans: 3			
Brass is an alloy	of		
(1) Copper and Tin(3) Zinc and Tin	(2) Lead ar (4) Copper	nd Tin and Zinc.	20
Ans: 4			0/
The ratio of the I	R.M.S. value to the avera	ge value of A.C. is ca	lled:
(1) Peak factor	(2) Load factor	(3) Form factor	(4) Power factor.
Ans: 3			

Definition: The maximum value attained by an alternating quantity during one cycle is called its **Peak value**.

The peak factor of any waveform is defined as the ratio of the peak value of the wave to the rms value of the wave. Peak factor = $V_p/(V_{rms}) = V_p/(V_p/\sqrt{2}) = \sqrt{2} = 1.414$.

R.M.S VALUE

Definition: That steady current which, when flows through a resistor of known resistance for a given period of time than as a result the same quantity of heat is produced by the alternating current when flows through the same resistor for the same period of time is called **R.M.S** or effective value of the alternating current

Definition: The average of all the instantaneous values of an alternating voltage and currents over one complete cycle is called **Average Value**.

Form factor

The form factor of an alternating current waveform (signal) is the ratio of the rms (root mean square) value to the average value. Here the average value is the mathematical mean of absolute values of all points on the waveform.

In square wave, the rms value and average value are same (whatever peak magnitude presents in that square wave). So, the form factor is equal to one. But, in other kind of waveforms (for

example, sine, triangle, rectangle, etc), the average value is less than the rms value. So, the value of form factor is greater than one. Hence, as compared to other waveforms, square wave has least value of form factor.

The product of the voltage and current is called apparent power and the product of the voltage, current and power factor is called as the real power. From the power triangle the real power is equal to the product of the apparent power and the power factor.

pur

https://www.electrical4u.com/electrical-mcq.php?subject=electric-circuits&page=14

In an AC circuit, the product of rms voltage and rms current is called as the apparent power. When the impedance is pure resistance, the apparent power is same as the real power. But, when the reactance is added, then the apparent power is greater than the real power.

	41.	Bronze isan alloy c	of	S, C	
	((1) Copper and Tin	(2) Lead and Tin	(3) Zinc and Tin (4) Copper and Zinc.
		Ans:1			
	42.	The property of ma	terial which enables	it to be drawn into wi	res is called?
		(1) Ductility	(2) Plasticity	(3) Malleability	(4) Toughness.
		Ans: 1	:0''		
	43.	Unit of measuring	inductance is –		
		(1) Ohm	(2) Coulomb	(3)Henry	(4) Weber .
		Ans: 3			
	44.	Ignition quality of	diesel fuel is expres	sed in terms of	
	C	(1) Cetane number (3) Ignition Tempe	(2) Calo rature (4) Dies	rific value el Knock.	
• • •).	Ans: 1			
	45.	Ignition quality of	petrol fuel is express	sed in terms of	
50		(1) Cetane number	(2) Calo (4) Dies	rific value el Knock	
		Ans: 3	(1) 2105		

Note	: Zener diodes are used for voltage regulation, as reference element	nts, sui
suppr	ressors, and in switching applications and clipper circuits.	5
47.	Stainless steel is an alloy of:	\mathbf{v}
	(1) Steel-Chromium-Tungsten (3) Steel-Vanadium-Nickel(2) Iron-Chromium-Nickel. (4) Steel-Tungsten-Nickel	
	Ans: 2	
48.	Suction in petrol engine contains:	
	(1) Fuel only (2) Mixture of air and fuel(petrol)	
	(3) Air only (4) None of these.	
	Ans: 2	
49.	Suction in diesel engine contains:	
	(1) Fuel only (2) Mixture of air and fuel (3) Air only (4) Nor	ne of the
	Ans: 3	
50.	Sound waves cannot travel through:	
	(1) Iron (2) Hydrogen (3) Oil (4) Vacuum.	
	Ans: 4	
6		