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Bihar Public Service Commission
Main Examination, 2019
Assistant Engineer

Paper-IV
General Engineering Science

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GENERAL ENGINEERING SCIENCE (PAPER-IV)

Q.1 A transformer is used
(A) to transform electrical to mechanical energy
(B) to obtain suitable DC voltage
(C) to transform AC into DC
(D) to obtain suitable AC voltage

Ans. (D)

End of Solution

Q.2 For amplification for a triode valve, signal to be amplified is connected between
(A) cathode and grid
(B) plate and grid
(C) cathode and plate
(D) a large negative potential

Ans. (A)

End of Solution

Q.3 A junction diode is used as a half-wave rectifier. Input signal is of frequency 50 Hz. The number of pulses rectified per second is
(A) 25/2
(B) 25
(C) 50
(D) 50×2

Ans. (C)
The output of a half-wave rectifier contains one pulse for each cycle of the input. So, when the input signal has 50 cycles/sec (50 Hz), the output signal also will contain 50 pulses/sec.

End of Solution

Q.4 Cloudy nights are warmer than clear nights because
(A) cloud absorbs heat during day and radiates in night
(B) cloud reflects back radiations to earth
(C) atmospheric temperature increases in pressure of clouds
(D) cloud absorbs cold and radiates heat

Ans. (B)

End of Solution

Q.5 Sea breeze is caused by
(A) conduction of heat
(B) radiation of heat
(C) convection of heat
(D) both conduction and convection of heat

Ans. (C)

End of Solution

Q.6 Streamline flow is more likely for liquids with

(A) high density
(B) high viscosity
(C) low viscosity
(D) none of the above

Ans. (B)

End of Solution

Q.7 Bernoulli's theorem concludes that

(A) velocity is less where pressure is more and vice versa
(B) fluid is viscous and compressible
(C) fluid is rotational
(D) viscosity of liquid is independent of pressure

Ans. (A)

End of Solution

Q.8 Orifice means

(A) a small hole through which fluid comes out
(B) a big hole through which fluid comes out
(C) disorderly flow of fluid
(D) pressure due to column of liquid

Ans. (A)

Orifice means a small hole through which fluid comes out.

End of Solution

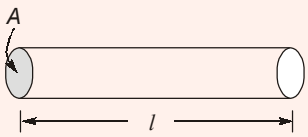
Q.9 When two metal rods of same length and same cross-section of conductivity k_1 and k_2 are connected in series, the effective conductivity is

(A) $k = \frac{k_1 + k_2}{2}$
(B) $k = k_1 + k_2$
(C) $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2}$
(D) $\frac{2}{k} = \frac{1}{k_1} + \frac{1}{k_2}$

Ans. (D)

The resistance of a wire with length l, cross-section A and conductivity k can be given by,

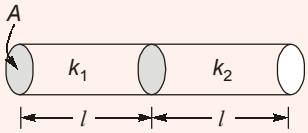
$$R = \frac{l}{kA}$$



When two resistors are connected in series, the equivalent resistance can be given by,

$$R_{eq} = R_1 + R_2$$

$$\frac{2l}{k_{eq}A} = \frac{l}{k_1A} + \frac{l}{k_2A}$$



So,
$$\frac{2}{k_{eq}} = \frac{1}{k_1} + \frac{1}{k_2}$$

End of Solution

Q.10 When the temperature difference between body and surrounding is large, which law will be applicable?

(A) Newton's law of cooling
(B) Reynold's law
(C) Stefan's law for cooling
(D) None of the above

Ans. (C)

End of Solution

Q.11 A voltmeter has

(A) small resistance and large current-carrying capacity
(B) large resistance and small current-carrying capacity
(C) small resistance and small current-carrying capacity
(D) large resistance and large current-carrying capacity

Ans. (B)

End of Solution

Q.12 If the speed of a generator is doubled, then induced e.m.f. will

(A) become half
(B) become double
(C) become four times
(D) remain unchanged

Ans. (B)

$$E_g = \frac{\phi PNZ}{60A}$$

When N becomes double, E_g also will become double.

End of Solution

Q.13 Angle of elevation of a tree can be measured by

(A) dumpy level
(B) prismatic compass
(C) theodolite
(D) plane table survey

Ans. (C)

Theodolite can be used to measure the vertical angles. Angle of elevation of a tree can thus be measured by theodolite.

End of Solution

Q.14 In plane survey, width of a river can be measured with
(A) total station
(B) dumpy level
(C) theodolite
(D) clinometer

Ans. (C)

End of Solution

Q.15 Area of a map can be measured by
(A) total station
(B) plane table survey
(C) chain survey
(D) planimeter

Ans. (D)

Planimeter is used to measure the area of a map.

End of Solution

Q.16 The function of sand in concrete is
(A) to reduce shrinkage
(B) to in-promote cement hydration
(C) to prevent efflorescence
(D) none of the above

Ans. (A)

The function of sand in concrete is to provide the bulk and avoid shrinkage.

End of Solution

Q.17 Advantage of cast iron over mild steel is
(A) it has higher ductility
(B) it has relatively low melting point
(C) it has higher tensile strength
(D) it is more malleable

Ans. (C)

Cast iron having more tensile strength as compare to mild steel.

End of Solution

Q.18 Pelton wheel extracts energy from
(A) dead weight of water
(B) axial and radial flow of water
(C) diesel generator
(D) impulse of moving water

Ans. (D)

Pelton wheel is the example impulse turbine. Which extract energy from impulse of moving water.

End of Solution

Q.19 Chemicals used to protect timber from fungi and insects are called
(A) timber preservatives
(B) timber seasoning
(C) knots
(D) none of the above

Ans. (A)

End of Solution

Q.20 Compressive strength of 2nd class brick is
(A) 105 kg/cm^2
(B) 70 kg/cm^2
(C) 35 kg/cm^2
(D) 125 kg/cm^2

Ans. (B)

End of Solution

Q.21 The function of thinner in paint is
(A) it provides desired consistency
(B) it provides adhesion and integrity
(C) it provides colors
(D) it makes the surface tough after drying

Ans. (A)
A paint thinner is a solvent used to provide the desired consistency to the paint, so that it can be applied on the surfaces easily.

End of Solution

Q.22 Which of the following is not responsible for water pollution?
(A) Turbidity
(B) Temperature
(C) Sodium
(D) Chlorine

Ans. (B)
Turbidity, sodium and chlorine cause adverse effects if present in excess. Hence they are pollutants in water. Temperature is not responsible for water pollution.

End of Solution

Q.23 Ultimate strain of mild steel rods is
(A) less than TMT rods
(B) more than TMT rods
(C) equal to that of TMT rods
(D) none of the above

Ans. (B)

End of Solution

Q.24 Critical path is in CPM
(A) cannot be compressed further
(B) is the shortest path
(C) is the longest path
(D) none of the above

Ans. (C)
Critical path in CPM is the longest path hence option (C) is correct.

End of Solution

Q.25 In PERT, if the length of two paths are equal, then critical path is decided on the basis of
(A) standard deviation
(B) early start time calculation
(C) early finish time calculation
(D) total float

Ans. (A)
In PERT, if the length of two paths are equal, then critical path decided on the basis of variance which is directly related with the standard deviation.

$$\text{Variance} = (\text{Standard deviation})^2$$

End of Solution

Q.26 A particle starts moving from rest under a constant acceleration. It travels a distance x in first 10 seconds and a distance y in next 10 seconds. Then
(A) $y = x$
(B) $y = 2x$
(C) $y = 3x$
(D) $y = 4x$

Ans. (C)
For a particle moving under a constant acceleration.

$$s = ut + \frac{1}{2}at^2$$

For 0 – 10 seconds,

$$s_{0-10} = 0 + \frac{1}{2} \times a \times 10^2$$

$$\Rightarrow \quad x = 50a \qquad \ldots(1)$$

For 0 – 20 seconds

$$s_{0-20} = 0 + \frac{1}{2} \times a \times 20^2$$

$$\Rightarrow \quad x + y = 200a$$

$$\Rightarrow \quad y = 150a \qquad \ldots(2)$$

from eq. (1) and (2)

$$y = 3x$$

End of Solution

Q.27 The angles between two forces to make their resultant a minimum and a maximum respectively are

(A) 0° and 90°
(B) 180° and 90°
(C) 90° and 180°
(D) 180° and 0°

Ans. (D)

For minimum resultant, forces should be acting opposite direction i.e. 180° and for maximum resultant, forces should be acting in same direction i.e. 0°.

End of Solution

Q.28 Two springs have their force constants k_1 and k_2 ($k_1 > k_2$). When both the springs are stretched by the same amount of length, the work done in these springs will be

(A) equal
(B) greater for k_1
(C) greater for k_2
(D) none of the above

Ans. (B)

As $k_1 > k_2$, work done in k_1 spring will be higher.

End of Solution

Q.29 An engine develops 10 kW of power. How much time will it take to lift a mass of 200 kg to a height of 40 m? (Take g = 10 m/s^2)

(A) 4 seconds
(B) 5 seconds
(C) 8 seconds
(D) 10 seconds

Ans. (C)

Given: Power = 10 kW; g = 10 m/s^2; M = 200 kg; h = 40 m

$$\text{Power} = \frac{\text{Work}}{\text{time}}$$

$$\text{time} = \frac{Mgh}{P} = \frac{200\times10\times40}{10000} = 8 \text{ seconds}$$

End of Solution

Q.30 The potential energy of a simple pendulum is maximum when it is

(A) at the turning points of oscillation
(B) at the equilibrium
(C) in between above two cases
(D) it has always a fixed value

Ans. (A)

Total energy of simple pendulum remains constant, at turning point velocity of pendulum becomes zero hence potential energy is maximum at these points.

End of Solution

Q.31 Which of the following is not a unit of Young's modulus?

(A) N/m^2
(B) megapascal
(C) dyne/cm^2
(D) N/m

Ans. (D)

End of Solution

Q.32 Energy per unit volume in a stretched wire is

(A) 1/2 load × strain
(B) load × strain
(C) stress × strain
(D) 1/2 stress × strain

Ans. (D)

End of Solution

Q.33 A simply supported beam and a cantilever have equal lengths. Both are subjected to same uniformly distributed load. Maximum bending stress in cantilever is (given EI are same)

(A) equal to that in simply supported
(B) more than simply supported
(C) less than simply supported
(D) cannot be compared

Ans. (B)

Maximum bending moment in cantilever will be more than what will be in simply supported beam, hence bending stress will be more in cantilever.

End of Solution

Q.34 Which section will be subjected to unsymmetrical bending?

(A) Channel section
(B) H-section
(C) Circular section
(D) Square section

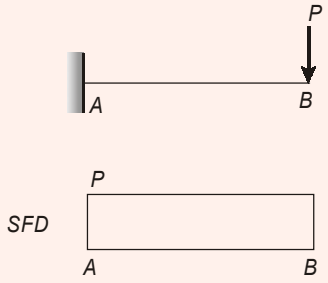
Ans. (A)

End of Solution

Q.35 A cantilever is loaded with a concentrated load P at the free end. The shear force at the centre of the beam will be

(A) P
(B) P/2
(C) zero
(D) none of the above

Ans. (A)



End of Solution

Q.36 In case of column, critical or Euler's buckling load at which buckled mode is possible is

(A) maximum force
(B) least force
(C) average force
(D) shear force

Ans. (B)

End of Solution

Q.37 The phenomenon of decreased resistance of a material to repeated stresses is called
(A) toughness
(B) stress concentration
(C) fatigue
(D) endurance limit

Ans. (C)

End of Solution

Q.38 Universal testing machine is used to determine
(A) compressive strength
(B) tensile strength
(C) shear strength
(D) both tension and compression

Ans. (D)

End of Solution

Q.39 Portland Pozzolana cement when compared to ordinary Portland cement will give after 28 days
(A) more compressive strength
(B) less compressive strength
(C) equal compressive strength
(D) none of the above

Ans. (B)

Portland Pozzolanna cement develops its strength at slower rate and hence its compressive strength in early days is less. It will give less compressive strength compared to ordinary portland cement after 28 days.

End of Solution

Q.40 For adiabatic change in gas
(A) $TV^{\gamma-1}$ = constant
(B) $TV^{\gamma-2}$ = constant
(C) $TV^{\gamma+1}$ = constant
(D) TV^{-1} = constant

Ans. (A)

End of Solution

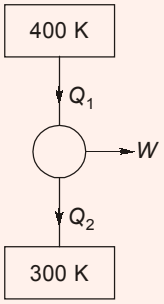
Q.41 Air in a cylinder is suddenly compressed by a piston which is then maintained at the same position. With the passage of time
(A) pressure increases
(B) pressure decreases
(C) pressure remains the same
(D) pressure may increase or decrease

Ans. (B)

End of Solution

Q.42 A Carnot engine operates between 127°C and 27°C. If the engine receives 60 cal heat from the source per cycle, quantity of heat rejected per cycle is
(A) 25 cal
(B) 45 cal
(C) 50 cal
(D) 55 cal

Ans. (B)



$$Q_2 = \frac{T_2}{T_1} Q_1$$

$$= \frac{300}{400} \times 600 \text{ cal} = 45 \text{ cal}$$

End of Solution

Q.43 An inventor claims to have made an engine which consumes 1 gm fuel per second of calorific value 2 kcal/gm and delivers 10 kW of power. Mark the correct statement.

(A) This is possible.
(B) Possibility of invention is determined by design of engine.
(C) Possibility of invention is determined by nature of fuel
(D) This is impossible.

Ans. (D)

$$Q_{in} = \text{Calorific value} \times \text{mass flow rate}$$
$$= 2 \text{ Kcal/gm} \times 1 \text{gm/sec}$$
$$= 2 \times 4.184 \text{ kW} = 8.368 \text{ kW}$$
$$P_{output} = 10 \text{ kW}$$

This is not possible as it violates energy conservation.

End of Solution

Q.44 A magnet is brought near to a coil in a closed circuit. Magnitude of induced e.m.f. in coil will depend on

(A) number of turns in the coil
(B) speed of the magnet
(C) field of the magnet
(D) all of the above

Ans. (D)

$$|e| = NBl\nu$$

N = number of turns in the coil
ν = speed of the magnet
B = field of the magnet (magnetic flux density)

End of Solution

Q.45 The inductive reactance of an inductor in an AC circuit depends on
(A) peak value of AC
(B) frequency of AC
(C) RMS value of AC
(D) None of the above

Ans. (B)
Inductive reactance,

$$X_L = 2\pi f L$$

f = frequency of the AC signal

End of Solution

Q.46 In an AC circuit having pure resistance
(A) current lags the voltage
(B) current leads the voltage
(C) current and voltage are in phase
(D) none of the above

Ans. (C)
In a pure resistive circuit, the current and voltage are in phase.

End of Solution

Q.47 At condition of resonance of an AC circuit containing a resistance, inductor and a capacitor
(A) total reactance of circuit is zero
(B) inductive reactance is zero
(C) capacitative reactance is zero
(D) none of the above

Ans. (A)
At resonance, the total reactance of an AC circuit is zero.

End of Solution

Q.48 In a series combination of R, L, C to an AC source at resonance, if R = 20 ohm, then impedance Z of the combination is
(A) 20 ohm
(B) zero
(C) 10 ohm
(D) 400 ohm

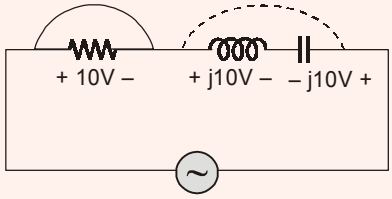
Ans. (A)
At resonance, the total reactance of the circuit will be zero and hence the impedance (Z) of the circuit will be equal to its resistance (R).
So, at resonance, $Z = R = 20$ ohm

End of Solution

Q.49 In a series L-C-R circuit, voltage across each resistance, inductance and capacitance is 10 volt. If resistance in the circuit is short-circuited, current in the circuit will be

(A) zero
(B) infinite
(C) 10 amp
(D) 5 amp

Ans. (B)



The voltages across inductor and capacitor are same in magnitude and hence the circuit will be at resonance.

Under the resonance condition, the series combination of inductor and capacitor acts as a short circuit. Now, if resistor also get short circuited, then the net impedance of the circuit will be zero and the current drawn by the circuit will be infinite.

End of Solution

Q.50 For long distance transmission of electrical energy

(A) only DC is used
(B) both AC and DC are used
(C) only AC is used
(D) None of the above

Ans. (A)

For long distance transmission of electrical energy, DC is used.

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