DETAILED SOLUTIONS

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CE BPSC Main Exam 2019 : Test Series
General Engineering
Test 4

Answer Key & Solutions | Objective Paper

ANSWER KEY

1.	(a)	11.	(b)	21.	(d)	31.	(b)	41.	(a)
2.	(b)	12.	(c)	22.	(a)	32.	(a)	42.	(a)
3.	(d)	13.	(b)	23.	(d)	33.	(b)	43.	(c)
4.	(d)	14.	(d)	24.	(d)	34.	(b)	44.	(b)
5.	(d)	15.	(a)	25.	(a)	35.	(c)	45.	(d)
6.	(a)	16.	(a)	26.	(a)	36.	(b)	46.	(b)
7.	(c)	17	(a)	27.	(b)	37.	(a)	47.	(b)
8.	(d)	18.	(c)	28.	(d)	38.	(d)	48.	(a)
9.	(b)	19.	(a)	29.	(c)	39.	(c)	49.	(b)
10.	(b)	20.	(c)	30.	(c)	40.	(c)	50.	(d)

DETAILED EXPLANATIONS

1. (a)

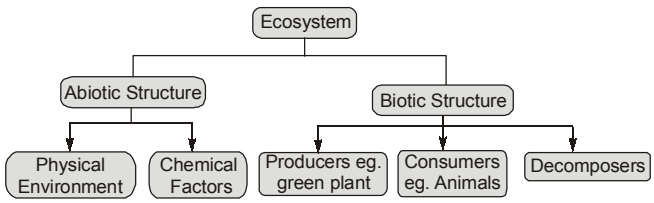
The biosphere is the global sum of all ecosystem. It can also be termed the zone of life on earth

2. (b)

Carbon monoide, an odourless and colourless gas, has its major origin in the incomplete combustion of carbonaceous material. It is a highly poisonous gas and is generally classified as an asphyxiant. Carbon monoxide has a strong affinity for combining with the haemoglobin of the blood to form carboxyhaemoglobin. This reduces the ability of haemoglobin to carry oxygen to the body tissues.

3. (d)

"An ecosystem is a group of biotic communities of species interacting with one another and with their non-living environment exchanging energy and matter."



4. (d)

At higher tempperature, rate of biological and chemical acticities are high thereby causing rapid depletion of D.O. this is likely the lead to anaerobic conditions.

Also the sunlight (photo synthesis) and satisfying oxygen demand also promote the self purificaton of stream.

5. (d)

Major gases responsible for causing the green house effect and global warming are:

(i) Carbondioxide (CO_2)

(ii) Methane (CH_4)

(iii) Nitrous oxide (N_2O)

(iv) Chlorofloro carbon (CFC)

Hence (d) is correct

9. (b)

Resource is a contraint in case of resource levelling operation.

20. (c)

Superplasticizer enhance workability of concrete by dispersing the cement particles. They impart negative charges to individual particles. Thus they confer high mobility to particles.

The setting time may be retarded due to overdose of admixture or by lowering of ambient temperature.

The superplasticizers leave very few air void and thus decrease freezing and thawing resistance.

21. (d)

Increase in fineness of cement increases rate of strength development by expediting the hydration reactions and increases shrinkage by leading to stronger reaction with alkali reactive aggregate making it more prone to cracking.

22. (a)

The mould size should be 7.06 cm cube as per IS 4031(Part-6) 1988.

23. (d)

The drying in concrete starting from a wetter consistency causes shrinkage of concrete.

24. (d)

The correct dry weight of each size range of each material is calculated from their actual weight in weight batching and weight of water is measured by making adjustments for surface and absorbed water.

25. (a)

The smaller the size of aggregates more is the surface area (inverse relation). More surface area means better bonding which increases the compressive strength and reduces stress concentration at surface. However this requires greater quantity of cement for same water-cement ratio.

26. (a)

The aggregate with rounded particles gives minimum ratio of surface area to the volume, thus requiring minimum cement paste to make good concrete. The angular shaped aggregates on the other hard provides good interlocking, hence good bond, between the particles, but it requires more cement paste to make workable concrete of high strength.

27. (b)

Fig (a)

The resultant output V_{01} is

$\longrightarrow V_{0\ \text{rms}}$ across $R = \dfrac{V_m}{\sqrt{2}}$

fig (b)

The resultant output V_{02} is

$\longrightarrow V_{0\ \text{rms}}$ across $R = \dfrac{V_m / 2}{\sqrt{2}}$

$\dfrac{V_m}{2}$ due to centertap

The ratio $\dfrac{V_{01}}{V_{02}}$ is

$$\frac{V_m / \sqrt{2}}{V_m / 2\sqrt{2}} = 2 : 1$$

28. (d)

$$Q_1(0^-) = 6C$$

$$V_{C_1}(0^-) = \frac{Q_1(0^-)}{C} = \frac{6}{1} = 6V$$

The initial voltage across the capacitor C_1 is 6V and capacitor C_2 is 0V i.e. $V_{C_2}\left(0^-\right) = 0V$

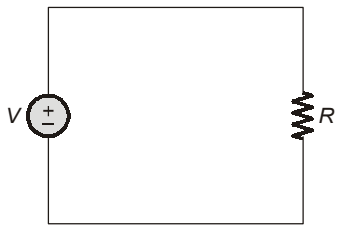
In steady state the voltage across two capacitors are equal i.e.

$$V_{C_1}(\infty) = V_{C_2}(\infty) = \frac{V_{C_1}\left(0^-\right)C_1 + V_{C_2}\left(0^-\right)C_2}{C_1 + C_2}$$

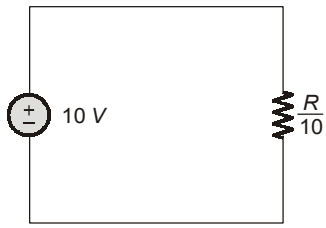
$$\Rightarrow \quad \frac{(6\times 1)+0}{1+2} = 2V$$

The steady state voltage across capacitor C_2 is 2V
and change $Q_2 = C_2V_2 = 2 \times 2 = 4C$

29. (c)



$$P = \frac{V^2}{R}$$



$$P' = \frac{(10V)^2}{R/10} = 1000\frac{V^2}{R}$$

$$\therefore \quad P' = 1000\,P$$

$\therefore$ Power dissipated scales up by a factor of 1000.

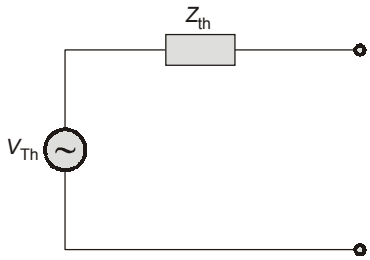
30. (c)

$V \propto I$ from Ohm's law
$V = RI$

R is resistor

31. (b)

Thevenin equivalent



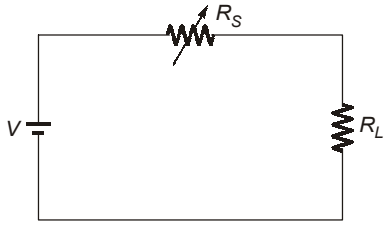
V_{Th} = Voltage source
Z_{Th} = Impedance (Ω)

32. (a)

Superposition theorem.

33. (b)

Equal to zero.



$$I = \frac{V}{R_S + R_L}$$

When $R_S = 0$. The current is maximum and power delivered to load is maximum.

34. (b)

From maximum power Transfer Theorem, when load resistance is equal to Thevenin equivalent resistance then the maximum power is delivered to the load.

35. (c)

The coupling coefficient is

$$k = \frac{M}{\sqrt{L_1 L_2}}$$

$\therefore$ 3rd statement is wrong.

36. (b)

$$\%\text{L.E.} = \frac{150}{83} = 1.81\%$$

40. (c)

Intensive properties, i.e. independent of mass are chemical potential, boiling point, velocity and viscosity. Extensive properties, i.e. dependent on mass of system are magnetic moment, electric charge, magnetisation, and potential energy. Thus correct choice is (c).

42. (a)

Given:

$$\begin{aligned} \Delta U &= -12 \text{ kJ} \\ W &= P(V_2 - V_1) \\ &= 100\ (1.4 - 1.9) \\ &= -100 \text{ kJ} \\ Q &= \Delta U + W \\ &= -12 - 100 = -112 \text{ kJ} \end{aligned}$$

43. (c)

$$\begin{aligned} F_{11} + F_{12} + F_{13} + F_{14} &= 1 \\ 0.1 + 0.4 + 0.25 + F_{14} &= 1 \\ F_{14} &= 0.25 \\ A_1 F_{14} &= A_4 F_{41} \\ 4 \times 0.25 &= 2 \times F_{41} \\ F_{41} &= 0.5 \end{aligned}$$

44. (b)

$$\frac{N_{S_1}}{N_{S_2}} = \sqrt{\frac{n_1}{n_2}} = \frac{1}{2}$$

$$\Rightarrow \quad N_{S_2} = 2\,N_{S_1}$$

$$\% \text{ Change} = \frac{N_{S_2} - N_{S_1}}{N_{S_1}} \times 100 = \frac{2N_{S_1} - N_{S_1}}{N_{S_1}} \times 100 = 100\ \%$$

45. (d)

The situation corresponds to minimum thermal resistance and consequently maximum heat flow rate.

46. (b)

For a cylindrical pipe, the critical radius of insulation is given by

$$r_c = \frac{k}{h_o} = \frac{0.15}{6} = 0.025 \text{ m} = 25 \text{ mm}$$

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