KUMARAGURU college of technology
character is life

Register Number:…….

PhD DEGREE EXAMINATIONS: APR/MAY 2024

(Regulation 2018)

Second Semester

ENVIRONMENTAL ENGINEERING

P18EEE0002: Climate Change and Adaptation

COURSE OUTCOMES

CO1: Apply the different concept of climate change and its consequences

CO2: Adopt the methodologies in finding the changes in climate

CO3: Apply basic climatic modelling

CO4: Predict climate changes and downscaling techniques

CO5: Identify impacts of climate changes

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions: -

PART A (10 x 1 = 10 Marks)

1. The climatic phenomenon that effects the temperature in Pacific Ocean… CO1 [K_2]

   a) La-Nina b) El-Nino

   c) Westerlies d) Hurricanes

2. **Assertion:** The increasingly detailed paleo-data require that hypotheses are quantitatively captured with regard to the mechanisms responsible for climate change. CO3 [K_3]

   Reason: Climate modelling begins by acquiring physical, chemical information and data retrieved from, among others, paleo-data.

   a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A

   c) A is true but R is false d) A is false but R is true

3. Sequence the climate models CO4 [K_3]

   1. Energy Balance model
   2. Ocean General Circulation model
   3. Advection – Diffusion model
   4. Atmospheric General Circulation model

   a) 1-2-3-4 b) 4-3-2-1

   c) 4-3-1-2 d) 1-3-4-2

4. Match list I and II and select the correct answer by using codes given below the lists: CO1 [K_3]

LIST I	LIST II
A. Montreal Protocol	1. Sustainable development
B. Rio Declaration	2. Ozone Layer Depletion
C. Kyoto Protocol	3. United Nations
D. Intergovernmental Panel on Climate Change	4. Green gas reduction

a) A – 2, B – 1, C –4, D – 3 b) A – 3, B – 4, C – 2, D - 1

c) A – 2, B – 4, C – 1, D – 3 d) A – 4, B – 3, C – 2, D - 1

5. The Montreal Protocol primarily aims to address the depletion of which atmospheric component. CO2 [K_1]

a) Carbon dioxide b) Methane

c) Ozone d) Nitrous oxide

6. State the correct statement(s) on climate sensitivity. CO2 [K_3]

1. Describes the magnitude of the change when the carbon dioxide concentration is doubled.
2. The resilience of ecosystems to climate change
3. understands the extent and magnitude of the effects of climate change.
4. The variability of weather patterns over a short period

a) 1 only b) 1 & 3 only

c) 2 & 3 only d) 1 & 2 only

7. In the latest IPCC report, IPCC (2013), more quantitative statements about the climate sensitivity could be made: CO4 [K_2]

i. likely range (> 66%): 1.5 to 4.5°C

ii. extremely unlikely (< 5%): smaller than 1°C

iii. very unlikely (< 10%): greater than 6°C

a) 1 only b) 2 only

c) 2 & 3 d) 1,2 and 3

8. Tool used to develop primarily for defining and monitoring drought is …… CO3 [K_2]

a) Standard Precipitation index b) Drought index

c) Preliminary drought index d) Standard drought index

9. State the correct statement on the factors influencing potential consequence of climate change on forestry and ecosystems. CO5 [K_3]

1. Decreased frequency of wildfires
2. Loss of biodiversity and habitat destruction
3. Expansion of suitable habitats for species
4. Increased resilience of ecosystems to disturbances

a) 1 only b) **2 only**

c) 3 only d) 4 only

10. How does climate change influence industry, settlement, and society? CO5 [K_2]

a) Decreased vulnerability to extreme weather events b) Increased costs for infrastructure repair and maintenance

c) Expansion of suitable areas for urban development d) Improved social cohesion and community resilience

PART B (10 x 2 = 20 Marks)

11. Explain the significance of the hydrological cycle in climate systems. CO1 [K_2]
12. What is the role of the Westerlies in global weather patterns? CO1 [K_2]
13. Explain the concept of climate feedbacks with one example. CO2 [K_2]
14. What evidence exists to show that climate change is occurring on a global scale? CO2 [K_3]
15. What are the governing equations in climate modelling and why are they important? CO3 [K_2]
16. Describe two key parameters commonly used in climate models. CO3 [K_2]
17. What factors contribute to the predictability of regional climate? CO4 [K_1]
18. State the limitations of global climate models in capturing regional climate variability. CO4 [K_3]
19. How does the changes in precipitation patterns due to climate change could impact water availability for human consumption and agriculture. CO5 [K_3]
20. Identify two health risks associated with climate change and explain how they can be mitigated through adaptation measures. CO5 [K_3]

PART C (6 x 5 = 30 Marks)

21. Explain the mechanisms behind monsoon rains and their importance to certain regions. CO1 [K_3]

22. Describe the greenhouse effect and its relation to global warming. Include the role of greenhouse gases in your explanation. CO1 [K_2]

23. State the significance and functions of UNFCCC. CO2 [K_2]

24. Discuss the significance of parameterization in climate models, providing an example of a process that is often parameterized. CO3 [K_2]

25. Briefly discuss on the data requirement to develop a climate model. CO4 [K_3]

26. Discuss on the vulnerability of an industry related to the settlement and society in the aspect of climate change. CO5 [K_2]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27.	Evaluate the role of the carbon cycle in regulating the Earth's climate and its strategies for reducing human impact on the carbon cycle to mitigate global warming.	CO1	[K_3]
28.	Elaborately discuss the precipitation trends and its impacts across the world during the last few decades.	CO2	[K_3]
29.	Analyze the main challenges associated with the development and validation of current climate models.	CO3	[K_3]
30.	Discuss on the various climate forecasting predictions.	CO4	[K_3]
31.	Elaborately discuss on the causes, weather pattern changes and impact of climate change in Agricultural ecosystem.	CO5	[K_3]

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