Program	BIOTECHNOLOGY			
Course Title	EMERGING TECHNOLOGY: BIOINSPIRED ENGINEERING			
Course Code	22EM203			
CONTINUOUS INTERNAL EVALUATION – I				
Sem	II		May 15th 2	
Max Marks	50		Max Duration	9

Instructions to Candidates:

- Answer all the questions, Write the answers in equivalence to mark assigned

Q.No.	Question	MKS
1	A four-year-old boy is suffering from B-cell acute lymphoblastic leukaemia and is admitted to hospital, identify one of the treatments given to specifically target and kill malignant cells.	10
2	Differentiate between synthetic and biological materials and add a note on its applications.	10
3	Explain the intricacies and relevance of Microfluidics.	10
4	Stem cells have revolutionized the field of medical research and therapy-justify.	10
5	Wide array of materials is designed and developed inspired by nature, comment with special emphasis to its thermal properties.	10

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5
	Test	Marks	30	30	-	-	10	20	20	-	-

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Department of Biotechnology

Date	July 3rd 2024	Maximum Marks	60
Course Code	**22EM203**	Duration	120 Mir
Sem	II Semester	CIE Improvement Test and Quiz	

EMERGING TECHNOLOGY: BIOINSPIRED ENGINEERING

Sl. No.	Questions (Quiz)	M	BTL
1.	Differentiate between Nomex and Thermoplastic honeycomb	2	3
2	Name the two categories of Blood substitutes.	2	1
3	What is the inspiration and the principle to harvest water from	2	1
4	Name any two buildings that are inspired by anthill	2	1
5	Name any two materials that haven used for developing photovoltaic cells	2	2

Sl. No.	Questions (Test)	M	BTL
1	The structural color has been exploited in textile industries. Identify the bioinspiration and add a note on principle of structural colors	10	3
2	Photosynthesis is the prime reason for the sustenance. Mankind has tried to utilize the inspiration for energy generation. Recognize the inspiration applied and comment on it	10	3
3	Many parts of India experience temperature up to 48^0C and labourers experience difficulty during sunny days to work indoor also. Design a building which can have a self cooling system that would help to give a congenial atmosphere to work.	10	4
4	The hexagonal aluminum structures have better structural strength and hence used for wide array of application, comment on these unique hexagonal structures inspired by nature.	10	2
5	In one of the construction sites, a fire broke leaving the worker with almost 50% burns. The worker is taken to hospital and with repeated treatment also, the skin does not heal, Comment on the possible treatment given to help to heal the burn wounds	10	4

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO 1	CO 2	CO 3	CO 4	L 1	L 2	L 3	L 4	L 5	L 6
	Test	Max Marks		10	-	40	-	10	20	20	-	-

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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution Affiliated to VTU)

I / II Semester B. E. Regular / Supplementary Examinations August-2024

BIOINSPIRED ENGINEERING

Time: 03 Hours *Maximum Marks: 100*

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10.

PART-A

			M	BT
1	1.1	What are Coral aggregates?	01	1
	1.2	Embryonic stem cells can differentiate into which types of cell?	01	1
	1.3	Name the two categories of Blood substitutes.	02	1
	1.4	Write any two factors that affect the drag reducing properties of riblets.	02	1
	1.5	Namib beetle utilize _____ as a fog water collector.	01	1
	1.6	Define Bioluminescence and the enzyme responsible for bioluminescence.	02	1
	1.7	Jarvik-7 implies to _____.	01	1
	1.8	What are two main features of Genetic Algorithm?	02	1
	1.9	What is a Bioreceptor in Biosensors?	01	1
	1.10	Differentiate between Artificial Neural Network and Convolutional Neural Network.	02	3
	1.11	What is Bioink?	01	1
	1.12	Write any two principles of microfluidics.	02	1
	1.13	A sequence of *DNA* has 100 adenine and 100 cytosine bases. What is the total number of nucleotides present in the segment?	01	1
	1.14	Name the inspiration in Gecko.	01	1

PART-B

2	a	Study of Synthetic biology aims to "make biology an engineering discipline". Emphasize on the approaches followed to design and develop a protocell / synthetic cell and add a note on its applications.	08	
	b	A 4-year old boy is suffering from Acute Lymphoblastic Leukaemia (*ALL*), undergoes chemotherapy but does not reduce the disease symptom. Which will be the better specific treatment the oncologist will prescribe for *ALL*?	04	
	c	Comment on the system that regulates an organism's innate sense of time and controls circadian rhythms.	04	
3	a	Compare and contrast between the biological and synthetic materials.	08	
	b	Explain the impact of microfluidic technology in the field of Biology.	08	

		OR		
4		Write explanatory note on a) Antireflection biomaterials b) Bio composites c) Biosteel d) Biopolymers	16	1
5	a	The wall of the i) Newly constructed house is painted in white and the contact angle is found to be 60°. ii) The lower surface of an old ship is painted in black and the contact angle is found to be 130°. Among the two surfaces which has enhanced shelf-life. Explain taking Lotus leaf as a case study for bioinspiration.	06	
	b	In the 2008 summer Olympics in Beijing, Michael Phelps won eight medals in different categories of swimming. He received media attention for his swimsuit that was inspired by an organism. Recognize the inspiration and comment on it.	06	
	c	Discuss on the inspiration for the Box Fish for the development of automotives.	04	
		OR		
6	a	i) Indian railways have designed a new train from Londa to Ahmedabad. Every time the train passes through the tunnel at a speed of 120Km per hour, creates a tunnel boom which can be heard even to 5 Km far away. The railways are trying to design a new train inspired by an organism to reduce the tunnel boom. Identify and explain the inspiration.	04	
		ii) Discuss in brief the mosquito inspired design of microneedle.	04	
	b	i) The Lavasa city in India is planned taking lessons from Eastgate Centre in Harare, Zimbabwe, which is designed fully ventilated and cooled by entirely natural means; recognize and explain the inspiration behind it.		
		ii) The plant burrs have been an inspiration to one of the commercialized materials and has been widely used in present day technology, Identify and explain the technique.	04	
			04	
7	a	This is a case study of two instances i) A 14 year old boy suddenly becomes unconscious while playing soccer and the fellow teammate checks his heart beat and gets to know that his heart beat is very feeble. What are the possible options and the time duration left for the team members to take him to doctor? ii) A 60 year old person will feel fatigue and meets the Doctor, He goes for thread mill test and ECG, His ECG reports reveal irregular heartbeats. Explain the Doctor's next treatment upon examining the patients in both instances.	08	

	b	Although haemodialysis revolutionized the treatment of kidney failure, it is far from perfect in mimicking the functions of the kidney. Explain, with reference to principle of ultra-filtration and dialysis.	08	4
		OR		
8	a	A fire breaks in an industry and two workers suffers 40 percent burns. Medication will heal the wounds but the scar remains. Explain the ideal treatment the doctor suggests to remove the scar.	05	2
	b	During the recent landslide in Kerala, a lady falls from the first floor and severely fractures the knee and the pelvic bone and becomes immobile. Comment on the treatment that can heal and improve her mobility.	06	2
	c	Discuss in detail the extracorporeal artificial lungs.	05	2
9	a	Compare and contrast between photosynthesis and photovoltaic cells.	08	3
	b	Can artificial intelligence overtake human intelligence towards development of functional robotics? Explain with reference to the design and development of robots.	08	4
		OR		
10	a	Honeycomb structures, inspired from bee honeycombs has widespread applications in various fields. Comment emphasizing on the hierarchical structure and the mechanical properties.	08	2
	b	Discuss on artificial tongue and nose and add a note on its design and development.	08	2