



**PES University, Bengaluru**  
(Established under Karnataka Act No. 16 of 2013)

**UE20CS935**

**MODEL QP: END SEMESTER ASSESSMENT (ESA)**  
**M TECH DATA SCIENCE AND MACHINE LEARNING\_ SEMESTER II**  
**UE20CS935- INTRODUCTION TO DEEP LEARNING& ITS APPLICATIONS**

Time: 3Hrs

Answer All Questions

Max Marks: 80

		<b>SECTION-A (20 marks)</b>	
1	a)	Explain the convolutional neural network architecture in detail.	4
	b)	Explain overfitting in neural networks? How to overcome the problem?	4
	c)	What are the activation functions in neural networks? What is the use of these activation functions?	4
	d)	What is the difference between single stage and multi stage object detection models?	4
	e)	Briefly explain GANs? What are their advantages?	4
		<b>SECTION-B (30 marks)</b>	
2		Create a convolutional neural network from scratch. Please consider it as a baseline. Dataset is available under the folder "3_food_classes".  Conditions to consider: --Parameters should not cross 20000 --Should not use more than 3 layers (except input and output) --Use optimizers like Batch Gradient descent, mini-batch or stochastic	10
3		Improve the baseline model performance and save the weights of improved model  Conditions to consider: --Apply Data Augmentation --No parameter limit --Can use more than 3 (except input and output) --Use any optimizers of your choice --Use callbacks to save the best model weights	20

SECTION C – 30 MARKS			
4		<p>Use the Transfer learning technique to improve the previous section model's classification performance.</p> <p>The pre-trained models weights are given to you. The architecture of pre-trained model till convolution layers and its corresponding weights are already saved under the folder 'base_model'. The given model convolution layers already freezed. Load these weights along with architecture using the following syntax:</p> <pre>cust_model=tf.keras.models.load_model("base_model")</pre> <p>"base_model" is the folder name under all the required models files are exist.</p> <p>Design the remaining layers of network in your own way (from flattening to output layer) and train only its weights with the dataset given.</p>	15
5		<p>Develop a Semantic segmentation model using Unet architecture on the given dataset.</p> <p>Dataset contains the images and the corresponding masks. Find the dataset under the folder "Unet_Dataset". Note that the masks are binary. Define the architecture accordingly.</p> <p>Students can make use of pre-trained Unet segmentation model using the library</p> <pre>import segmentation_models as sm</pre> <p>Hints</p> <ol style="list-style-type: none"> <li>1: Load all the images in one array of size 150x128x128x3 Where 150 is total number of trained images 128x128x3 is each image size</li> <li>2. Load all the masks in one array of size 150x128x128x1</li> <li>3. Scale both the above two arrays</li> <li>4. Split the data into train and test</li> <li>5. Define the pre-trained segmentation model</li> <li>6. Compile with appropriate loss and metric and fit the data into it.</li> </ol> <p>Run the model for minimum 5 epochs and present your result. The solution will be evaluated based on approach only as it take lot of epochs to produce good result.</p>	15

