**Enrolment No:**

## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
### End Semester Examination, July 2020

Course: Electromagnetic Fields and Electrical Materials                     Semester: IV
Program: B.tech Electrical Engineering                                             Time 03 hrs.
Course Code: EPEG 2012                                                      Max. Marks: 100
Instructions:

1. Attempt all the questions (Theory, Numerical, Case study etc.) on A4 size blank sheets.
2. Attempt all questions serially as per question paper.
3. Answer should be neat and clean. Draw a free hand sketch for circuits/tables/schematics wherever required.
4. Scan the whole answer script and check the resolution carefully before upload on the blackboard. Note that answer scripts will be considered for evaluation only through Blackboard. No other mode of submission is acceptable.
5. You are expected to be honest about each attempt which you make to progress in life
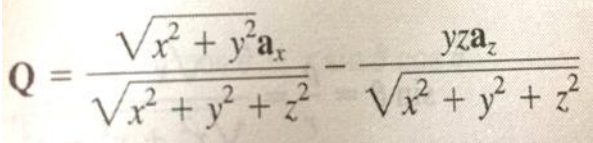
### SECTION A - 40 Marks

| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | Discuss the concept of unit vector and its importance in field theory. Elaborate your understanding with reference on unit vectors with reference to Cartesian, cylindrical and spherical coordinate system. | 20 | CO 2,1 |
| Q 2 | Given magnetic boundary conditions for the interface between two magnetic media with $\mu_1$ and $\mu_2$ as the respective permeability of media1 and media 2. <br> Given $\mathbf{H_1} = -2\ \mathbf{a_x} +6\ \mathbf{a_y} +4\mathbf{a_z}$ A/m in region y-x-2 $\leq$ 0, where $\mu_1= 5\ \mu_0$ , calculate <br>    a. $\mathbf{M_1}$ and $\mathbf{B_1}$ <br>    b. $\mathbf{H_2}$ and $\mathbf{B_2}$ in region y-x-2 $\geq$ 0, where $\mu_2= 2\ \mu_0$ | 20 | CO 3,4 |
| | **SECTION B - 60 Marks** | | |
| Q 3 | For a sheet of charge with uniform charge density the Electric Field Intensity is independent of distance. Justify using Gauss' Law. | 10 | CO 2 |
| Q 4 | Define Biot Savart's law. Determine the magnetic field intensity dH if the line dl=3x+4y +2z carries current 10mA.at a   radius vector R=3y+4z.by using Biot-Savarts law, at a point (3,4,6) | 10 | CO 3 |
| Q 5 | a. Explain the fourth Maxwell Equation for static fields. <br> b. Explain the scalar and vector magnetic potential for magnetic fields. | 5+5=10 | CO 2,4 |

NOTE : The submission time of the Question Paper Answer Sheet is 24 Hhrs from the scheduled time (*exceptional provision due to extraordinary circumstance due to COVID-19 and due to internet connectivity issues in the far-flung areas*).
No Submission will be entertained after 24 Hrs

| Q 6 | Discuss phenomenon of electromagnetic levitation and give its applications. | 10 | CO 4 |
|---|---|---|---|
| Q 7 | Discuss the phenomenon of magnetization in materials. Hence, enumerate various types of magnetic materials. | 10 | CO 4 |
| Q 8 | a. Convert Q into cylindrical coordinates at (0,-4,3).<br><br>$$Q = \frac{\sqrt{x^2 + y^2}\,\mathbf{a}_x}{\sqrt{x^2 + y^2 + z^2}} - \frac{yz\mathbf{a}_z}{\sqrt{x^2 + y^2 + z^2}}$$<br><br>b. Points P and Q are located at (1,3,5) and (-2,1,5). Calculate the position vector **P** and distance vector from P to Q. | 5+5=10 | CO 1 |

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