

**B.Tech. – VIEP – ELECTRICAL ENGINEERING  
(BTELVI)**

00236

**Term-End Examination**

**June, 2014**

**BIEE-009 : APPLIED ELECTROMAGNETICS**

*Time : 3 hours*

*Maximum Marks : 70*

**Note :** *Attempt any seven questions.*

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1. Express the field  $\vec{E} = \left( \frac{A}{r^2} \right) \vec{q}_r$  (spherical) in
- (a) Rectangular components
  - (b) Cylindrical components 5+5
2. (a) Derive the expression for electric field due to infinite line charge. 5
- (b) What is divergence theorem ? Explain physical significance of divergence. 5
3. (a) What are dielectrics ? Discuss the effect of field on dielectrics. 5

- (b) In the cable shown in Figure 1, if  $r_1 = 10$  mm,  $r_2 = 15$  mm,  $r_3 = 20$  mm,  $\epsilon_{r1} = 2$ ,  $\epsilon_{r2} = 4$ , find the capacitance of the cable if it is 10 km long.

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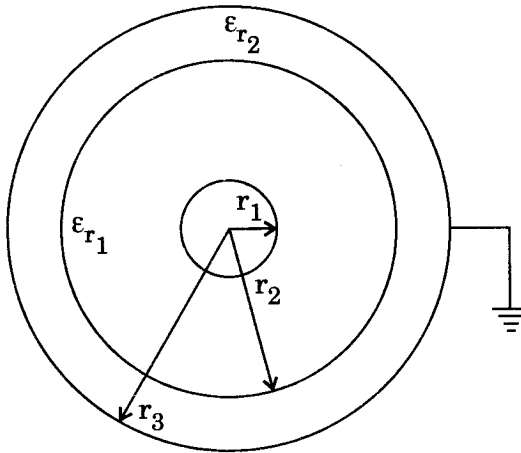


Figure 1

4. Derive the expression for  $\nabla^2 V$  in the three coordinate system.
5. What is Ampere's circuital law ? Prove it and find the field due to a solid cylindrical conductor using Ampere's law.

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6. The loop shown in Figure 2 is inside a uniform magnetic field  $\vec{B} = 50 \vec{a}_x$  (mWb/m<sup>2</sup>). If side DC of the loop cuts the flux lines at the frequency of 50 Hz and the loop lies in the yz plane at time  $t = 0$ , find

- (a) induced emf at  $t = 1$  ms.  
 (b) induced current at  $t = 3$  ms.

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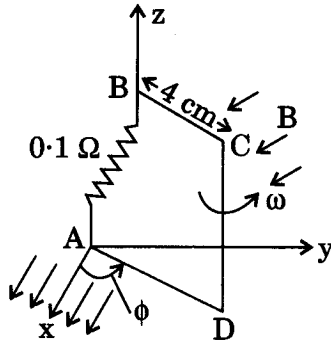


Figure 2

7. (a) Consider square loop of length  $a$  through which current of  $I$  amp is passing in clockwise direction. Find  $H$  at the centre of the square loop.  
 (b) State and prove Poynting's theorem.
8. What is uniform plane EM-wave ? Derive the uniform plane wave equation for electric field in free space that is entirely in  $y$  direction and has an apparent velocity in  $x$  direction.

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9. (a) For electromagnetic wave prove that  $\vec{E} \cdot \vec{H} = 0$  and  $\vec{E} \times \vec{H}$  is having the direction of propagation of wave. 5
- (b) A lossless transmission line is 80 cm long and operates at a frequency of 100 MHz. The line parameters are  $L = 0.25 \mu\text{H/m}$  and  $C = 100 \text{ PF/m}$ . Find characteristic impedance, phase constant, velocity of line and input impedance for  $Z_L = 100 \Omega$ . 5
10. Write short notes on any *two* of the following : 5×2
- (i) Effect of field on dielectric
  - (ii) Maxwell equations
  - (iii) SWR
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