V.P. & R.P.T.P.Science College, V.V.Nagar

Internal Test

B.Sc.SEMISTER -IV

Subject : Mathematics (US04EMTH05)

Date : 15/03/2014 Maximum Marks:30

Day : Saturday Time :1.00 pm to 2.00 pm

Que.1 Attempt the following.(Any Three) 6

1. Find normal vector of the function $y^2 = 2x^3$ at point (2,4).
2. Prove that $\overline{\nabla}(\frac{f}{g}) = \frac{g\overline{\nabla}f - f\overline{\nabla}g}{g^2}$
3. Prove that $\overline{\nabla} \cdot (f\overline{\nabla}g) = f\nabla^2 g + \overline{\nabla}f \cdot \overline{\nabla}g$
4. Define Curl of vector field.
5. Prove that $\forall a \in \mathbb{B}$, (1) $a + a = a$ (2) $a.a = a$
6. If $a + x = b + x$ and $a + x' = b + x'$ then prove that $a = b$

Que.2 [A] Prove that $f(x, y) = \tan^{-1}(\frac{y}{x})$ is harmonic function 5

[B] Find Gradient of $f(x, y) = \log r$, where $\overline{r} = x\overline{i} + y\overline{j}$ 3

OR

Que.2 [A] Find directional derivative of $f(x, y, z) = (2x^2 + 3y^2 + z^2)$ at point (2,1,3) in direction of $\overline{a} = \overline{i} - 2\overline{k}$ 4

[B] Find Gradient of $f(x, y, z) = (x^2 + y^2 + z^2)^2$ at point (1,2,3) 4

Que.3 [C] Verify $\overline{\nabla} \cdot (f\overline{v}) = f(\overline{\nabla} \cdot \overline{v}) + \overline{v} \cdot (\overline{\nabla}f)$ for $f = e^{xyz}$ and $\overline{v} = ax\overline{i} + by\overline{j} + cz\overline{k}$ 5

[D] Prove that $\overline{\nabla} \cdot (\overline{\nabla} \times \overline{v}) = 0$ 3

OR

Que.3 [C] If $f(x, y) = \log(x^2 + y^2)$then prove that $\overline{\nabla} \cdot (\overline{\nabla}f) = \nabla^2 f = 0$ 4

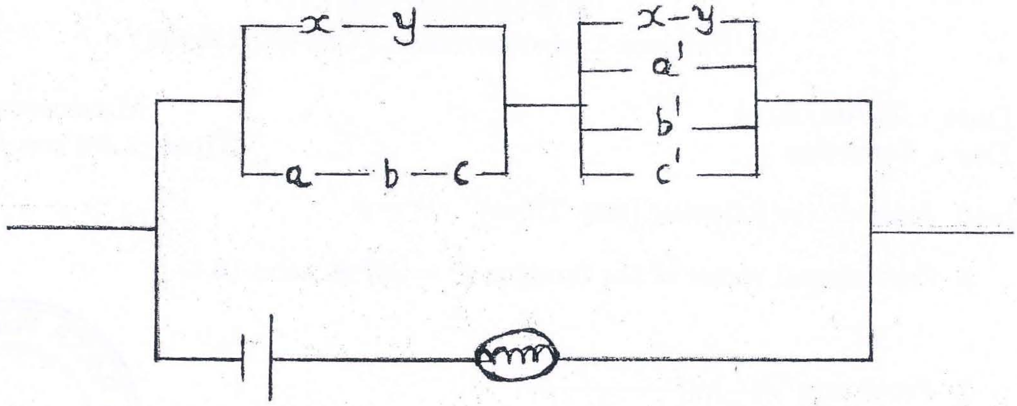
[D] Prove that $\overline{\nabla} \cdot (r^n\overline{r}) = (n + 3)r^n$ where $\overline{r} = x\overline{i} + y\overline{j} + z\overline{k}; r = |\overline{r}|$ 4

Que.4 [E] State and prove De-Morgan's law for Boolean algebra. 5

[F] If a and b are elements of a Boolean algebra $\mathbb{B}$ satisfying the relation $a \leq b$ then prove that $a + bc = b(a + c)$, $\forall c \in \mathbb{B}$ 3

OR

Que.4 [E] Find Boolean function of given switching circuit ,then simplified it. Also draw simplified circuit. 4



[F] $\forall a \in \mathbb{B}$; prove that inverse of a is unique. 4

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