Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(CE) (2018 Batch)/(ECE) (Sem.–3)

MATHEMATICS-III (TRANSFORM & DISCRETE MATHEMATICS)

Subject Code : BTAM-301-18

M.Code : 76373

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Define gradient of a scalar point function.

b) Define Solenoidal and irritational fields.

c) State Gauss divergence theorem.

d) Define Laplace transform.

e) Write the relation between Laplace and Fourier transform.

f) State Convolution theorem.

g) Write Gibbs phenomenon.

h) Define dirac-delta function and impulse function.

i) Write the Laplace transform of $t^2 e^{-t}$.

j) If $u = x^2 y\, i + yz\, j + z^2\, x\, k$. Find the divergence of u.

SECTION-B

2. Find the directional derivative of $\phi = 5x^2y - 5y^2z + 2.5z^2x$ at the point P (1, 1, 1) in the direction of the line $\frac{x-1}{2} = \frac{y-3}{-2} = z$.

3. If $f = (x^2 + y^2 + z^2)^{-n}$. Find n if div grad $f = 0$.

4. Solve the equation $\frac{d^2y}{dt^2} - 2\frac{dy}{dt} + 3y = \sin t$, $y - \frac{dy}{dt} = 0$, when $t = 0$, by the Laplace transform method.

5. Express $f(x) = x \sin x$, $0 < x < 2\pi$ as a Fourier series.

6. Find the inverse Laplace transform of $\frac{se^{-s/2} - e^{-s}}{s^2 - \pi^2}$

SECTION-C

7. Verify Stoke's theorem for the vector field $F = (x^2 + y^2)\, i - 2xy\, j$ taken around the rectangle bounded by the lines $x = \pm a$, $y = 0$, $y = b$.

8. If $f(x) = \sin x$, $0 \le x \le \pi$ and $f(x) = 0$, $-\pi \le x \le 0$, Prove that

$$f(x) = \frac{1}{\pi} - \frac{\sin x}{2} - \frac{2}{\pi}\sum_{n=1}^{\infty} \frac{\cos 2nx}{4n^2 - 1}$$

Hence show that $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \ldots = \frac{\pi - 2}{4}$.

9. a) Evaluate :

$$L\left\{e^{-t}\int_0^t \frac{\sin t}{t}\,dt\right\}$$

b) Show that $\nabla^2 (r^n) = n(n+1) r^{n-2}$, where $r^2 = x^2 + y^2 + z^2$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.