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Total Number of Pages : 02

B.Tech
15BS1104

2nd Semester Back Examination 2018-19

MATHEMATICS - II

BRANCH : AEIE, AERO, AUTO, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE,
ELECTRICAL, ETC, FAT, IEE, IT, MECH, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE

Max Marks : 100

Time : 3 Hours

Q.CODE : F130

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- Write Laplace Transform of Unit step function.
- $L(f * g) =$ _____.
- Write the relation between beta and gamma function.
- If $f(x) = x^2, -\pi < x < \pi$, then the value of Fourier coefficient $b_n =$ _____.
- Determine Inverse Laplace transform of $\frac{s}{s^2+9}$.
- $F(x) = x + \sin x$ is even function or odd function. Justify your answer.
- Derive gradient of $f(x, y, z) = \cos xyz + xy$.
- Determine a normal vector n of $z^2 = 4(x^2 + y^2)$ at the point $P: (1, 0, 2)$.
- State Stokes's theorem.
- State whether the vector $\vec{v} = yz\hat{i} + zx\hat{j} + xy\hat{k}$ is irrotational or not.

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Calculate Laplace transform of
 - $t \sin at$
 - $e^{2t} \cos 4t$
- Solve the integral equation $y(t) = t + \int_0^t y(u) \sin(t-u) du$.
- Calculate Inverse Laplace transform of $\frac{1}{s(s+1)(s+2)}$.
- Formulate $Y(s)$ for the given initial value problem $y'' + 2y' + 5y = 1, y(0) = 0, y'(0) = 1$.
- Calculate Fourier series of $f(x) = x^2, -\pi < x < \pi, p = 2\pi$.
- Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$.
- Determine length of the curve $\vec{r}(t) = 2\cos t \hat{i} + 2\sin t \hat{j} + 3t \hat{k}$ from $(2, 0, 0)$ to $(2, 0, 6\pi)$.
- For any scalar function $f(x, y, z)$ and vector function $\vec{v} = [v_1, v_2, v_3]$, Prove that
 - $\text{Curl}(\text{grad } f) = 0$
 - $\text{Div}(\text{curl } \vec{v}) = 0$
- Calculate unit normal vector of the surface $r(u, v) = [u \cos v, u \sin v, u^3]$.
- Explain, the given differential $3x^2 dx + 2yz dy + y^2 dz$ is exact or not.
- Evaluate the integral :
 $\int_C y^3 dx + x^3 dy$, C : Straight line segment from $(0, 0)$ to $(1, 1)$.
- Develop Fourier Cosine transformation of $f(x) = e^{-kx}, k > 0, x > 0$.

Only Long Answer Type Questions (Answer Any Two out of Four)

Q4 a) Evaluate Fourier integral representation of $f(x) = \begin{cases} 0, & \text{if } x < 0 \\ \frac{1}{2}, & \text{if } x = 0 \\ e^{-x}, & \text{if } x > 0 \end{cases}$. **(10)**

Q5 Prove that the integral : **(16)**

Is independent of path in any domain and hence find the value of I from $A:(0,0,1)$ to $(1, \frac{\pi}{4}, 2)$.

Q6 Verify Green's theorem for the given integral. **(16)**
 $\int_C [(xy + y^2)dx + x^2dy]$, Where C is bounded by the curve $y = x$ and $y = x^2$.