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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, April - 2018
MATHEMATICS – II
(Common to ME, MCT, MIE, MSNT)

Time: 3 Hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) If $\bar{a} = a_1 i + a_2 j + a_3 k$ and $\bar{r} = xi + yj + zk$ then find $\nabla(\bar{r}.\bar{a})$ [2]

b) State Divergence theorem. [3]

c) If f is defined as $f(x) = \begin{cases} -\pi \text{ in } & -\pi < x < o \\ x \text{ in } & 0 < x < \pi \end{cases}$ find a_0 in Fourier series. [2]

d) Write the Euler's formulae for Fourier series in the interval $(-\ell, \ell)$. [3]

e) Prove that $\delta E^{1/2} = E - 1$ [2]

f) If h = 1, evaluate $\Delta \dfrac{1}{x!}$ [3]

g) Find the two values between which the root of $3x - 1 = \cos x$ lies. [2]

h) If $A = \begin{bmatrix} -3 & 4 \\ -6 & 16 \end{bmatrix}$, find LU decomposition. [3]

i) If $\dfrac{dy}{dx} = x - y$ and y (0) = 1 then find first approximation upto 2nd degree terms $y^{(1)}(x)$
using picards method. [2]

j) $y'' = x - y$, with h=0.25 then find the recurrence formula relating y_i, y_{i-1}, y_{i+1} [3]

PART-B

(50 Marks)

2.a) Find the directional derivative of $f(x,y,z)=xy^2+yz^3$ at the point (2,-1,1) in the direction of the vector i + 2j + 2k.

b) Evaluate $\oint_e (yzdx + xzdy + xydz)$ over a helix $x = a\cos t, y = a\sin t, z = kt \ as \ t$ varies from

0 to 2π. [5+5]

OR

3. Use Stoke's Theorem to evaluate $\int (x + y)dx + (2x - z)dy + (y + z)dz$ where C is the

boundary of the triangle with vertices (2,0,0), (0,3,0) and (0,0,6). [10]

4.a) Obtain Fourier series for $f(x) = x + x^2$ in $-\pi < x < \pi$

b) Find the Fourier Transform of $f(x) = \begin{cases} \cos x & 0 < x < a \\ 0 & x \geq a \end{cases}$ [5+5]

OR

5. Find the fourier sine transform of $\dfrac{1}{x(a^2 + x^2)}$.   [10]

6.a) Find y(42) from the following data using Newton's forward interpolation formula.

x	20	25	30	35	40	45
y	352	332	291	260	231	204

b) Apply Lagranges formula to find f(5) given that f(1) = 2, f(2) = 4, f(3) = 8, f(4) = 16 and f(7) = 128.   [5+5]

OR

7. Fit an equation of the form $y = ab^x$ to the following data.   [10]

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

8.a) Find a root of the equation $\sin x = 1 - x$ using Newton Raphson method.

b) Find a real root of $x \log_{10} x - 1.2 = 0$ correct to four decimal places using Regula falsi method.   [5+5]

OR

9. Solve the system of equations using Gauss Seidal method.   [10]

   x + 5y + 2z = 7
   7x - y + z = 2
   x + 2y + 5z = 9

10. Find y(0.1) and y(0.2) using Runge Kutta method given that $y' = x^2 - y$, $y(0) = 1$. [10]

OR

11. Solve the boundary value problem $y'' = 2y$, with h = 0.5 given that y(0) = 0, y(2)=2 by finite difference method.   [10]

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