Code No: 132AB

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, August - 2019

MATHEMATICS-II

(Common to EEE, ECE, CSE, EIE, IT, ETM)

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) Find $L\left[e^{t-3}u(t-3)\right]$. [2]

b) Find $L^{-1}\left[\frac{s+2}{(s^2+4s+5)^2}\right]$. [3]

c) Evaluate $\int_0^\infty e^{-3x}x^3dx$. [2]

d) Evaluate $\beta(\frac{1}{2},\frac{1}{2})$ [3]

e) Evaluate $\int_0^2\int_0^x e^{x+y}\,dy\,dx$. [2]

f) Evaluate $\int_0^{2\pi}\int_{a\sin\theta}^{a} r\,dr\,d\theta$. [3]

g) Find div $\bar{r}$, where $\bar{r}=x^2i+y^2j+z^2k$. [2]

h) Prove that $\bar{r}$ is irrotational, where $\bar{r}=xi+yj+zk$. [3]

i) State Green's theorem in plane. [2]

j) If $\bar{F}=3xyi-y^2j$, evaluate $\int_c \bar{F}.\bar{dr}$, where c is the curve in the xy-plane $y=x$ from (0,0) to (1,2). [3]

PART-B

(50 Marks)

2.a) Find $L\left[\int_0^t e^t\frac{\sin t}{t}dt\right]$.

b) Find $L^{-1}\left[\frac{s}{s^4+s^2+1}\right]$. [5+5]

OR

3. Solve $y'' + 2y' + y = t$, given that $y = -3$, $y' = -1$ when $t = 0$. [10]

4.a) Evaluate $\int_0^{\frac{\pi}{2}} \sin^2\theta \cos^2\theta \, d\theta$ using β-Γ functions.

b) Evaluate $\int_0^{\infty} x^6 e^{-2x} dx$ using β, Γ functions. [5+5]

OR

5.a) Evaluate $\int_0^2 x\left(8-x^3\right)^{1/3} dx$.

b) Evaluate $\int_0^{\infty} x^7 e^{-2x^2} dx$ [5+5]

6.a) Change the order of integration and evaluate $\int_0^{\infty}\int_x^{\infty} \frac{e^{-y}}{y} dy dx$.

b) Find the volume of the Tetrahedron bounded by the planes x=0, y=0, z=0 and $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$. [4+6]

OR

7.a) Evaluate $\iint xy(x+y)\,dx\,dy$ over the region bounded by parabolas $x^2 = y$ and $y^2 = -x$.

b) Evaluate $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z \, dz \, dx \, dy$. [5+5]

8.a) Show that $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$.

b) If $F = x^2 y\, i - z\, y\, j + 2\, y\, z^2\, k$, Find Curl F and Div F at the point (1, 1, 1). [6+4]

OR

9.a) If ϕ is scalar point function and F is a vector point function then show that

i) $\nabla \times (\nabla \varphi) = 0$ ii) $\nabla.(\nabla \times F) = 0$

b) If $F = \nabla(x^3 + y^3 + z^3 - 3xyz)$ then show that F is irrotational. [5+5]

10. Verify green's theorem for $\int (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of the region bounded by $y = \sqrt{x}$ and $y = x^2$. [10]

OR

11. Verify the Stoke's theorem for the vector field $\vec{F} = xz\vec{i} + xy\vec{j} + 3xz\vec{k}$ over the surface $2x + y + z = 2$ in the first octant. [10]

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