R16

Code No:131AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B .Tech I Year I Semester Examinations, December - 2018
MATHEMATICS-II
(Common to CE, ME, MCT, MMT, AE, MIE, PTM, CEE, 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) Write the Dirichlet's Conditions of Laplace transform. [2]

b) Find the Laplace transform of 3Cos 4(t-2) u(t-2). [3]

c) Write the relation between β and γ functions. [2]

d) Evaluate $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$. [3]

e) In evaluating $\iint_R f(x,y)dydx$ over the first quadrant of the circle $x^2+y^2=4$, find the limits. [2]

f) Evaluate $\int_0^1 \int_0^x y\,dy\,dx$. [3]

g) Evaluate ∇xyz. [2]

h) If $\bar{F} = xi + xyj + zxk$, Evaluate curl $\bar{F}$. [3]

i) State the transformation between surface and volume integral in Cartesian form. [2]

j) State Gauss divergence theorem. [3]

PART - B

(50 Marks)

2. Solve $y''' - 2y'' + 5y' = 0$ given that $y(0) = y'(0) = 0, y''(0) = 1$ using Laplace transform. [10]

OR

3.a) Using Laplace transform of evaluate $\int_0^\infty t\, e^{-t}\, Sin\, t\, dt$.

b) Using Convolution theorem find $L^{-1}\left[\frac{1}{(s^2+a^2)^2}\right]$. [5+5]

4.a) Show that $\int_0^\infty x^{2n-1}e^{-ax^2}dx = \frac{\Gamma(n)}{2a^n}, a > 0, n > 0$.

b) Evaluate $\int_0^1 x^3\sqrt{1-x}$ dx using Beta Gamma functions. [5+5]

OR

5.a) Evaluate $\int_0^1 x^4 (log\frac{1}{x})^3 dx$.

b) Evaluate $\int_0^\infty x^2 e^{-x^8} dx \times \int_0^\infty x^2 e^{-x^4} dx$. [5+5]

6.a) Evaluate $\int\int_R \; y\,dx\,dy$ where R is bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.

b) Evaluate $\int_0^{\pi/2}\int_0^{a\sin\theta}\int_0^{(a^2-r^2)/a} r dr\,d\theta\,dz.$ [5+5]

OR

7.a) Evaluate $\int_0^{\pi/4}\int_0^{a\sin\theta}\frac{r}{\sqrt{a^2-r^2}}\,dr\,d\theta.$

b) Evaluate $\iiint_V \; xyz\,dx\,dy\,dz$ where V is bounded by the co-ordinate planes and the plane x + y + z =1. [5+5]

8.a) If $\bar{r}$ is the position vector of the point (x,y,z), prove that $\nabla^2(r^n) = n(n+1).r^{n-2}$.

b) Find the directional derivative of the function 2xy + z^2 at the point (1, -1, 3) in the direction of the vector $\bar{i} + 2\bar{j} + 2\bar{k}$. [5+5]

OR

9.a) Prove that $\nabla\times(\nabla\times\bar{F}) = \nabla(\nabla.\bar{F}) - \nabla^2\bar{F}$.

b) Find the angle between surfaces $x^2 + y^2 + z^2 = 9$ *and* $z = x^2 + y^2 - 3$ at the point (2, -1, 2). [5+5]

10. Verify Stoke's theorem for $\bar{F} = (2x-y)\bar{i} - yz^2\bar{j} - y^2z\bar{k}$ and S is the upper half surface $x^2 + y^2 + z^2 = 1$ of the sphere and C is its boundary. [10]

OR

11.a) Find the work done in moving a particle by the force $\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ along the line joining (0,0,0) to (2,1,3).

b) Evaluate $\iint_S \bar{F}.\bar{n}ds$ where $\bar{F} = 12x^2y\bar{i} - 3yz\bar{j} + 2z\bar{k}$ and S is the portion of the plane x+y+z=1 included in the 1st octant. [5+5]

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