R16

Code No: 132AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, August/September - 2017

MATHEMATICS-II

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

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 $L^{-1}\left(\frac{1}{s^2-2s+5}\right)$ [2]

b) Let $L\{f(t)\}=\bar{f}(s)$, Prove that $L\{f(at)\}=\frac{1}{a}\bar{f}\left(\frac{s}{a}\right)$. [3]

c) Define Gamma function. [2]

d) Evaluate $\int_0^{\frac{\pi}{2}} Sin^3 x Cos^5 x dx$ using Beta and Gamma function. [3]

e) Evaluate $\int_0^1\int_2^3\int_3^4 (x+y+z)dxdydz$ [2]

f) Find the area of the circle using double integral. [3]

g) Give short note on gradient of a scalar point function. [2]

h) Find the scalar potential function of an irrotational vector $\bar{f}=x\bar{i}+y\bar{j}+z\bar{k}$ [3]

i) Evaluate $\oint_C xdx+ydy+zdz$ where C is a circle $x^2+y^2=1$ in xy - plan. [2]

j) Apply Gauss divergence theorem to evaluate $\iint x\,dydz+y\,dzdx+z\,dxdy$ over the surface of the sphere of radius 'a' units. [3]

PART-B

(50 Marks)

2.a) Find Laplace transform of $\frac{1-e^t}{t}$.

b) Find the inverse Laplace transform of $\frac{1}{(s^2+1)^2}$. [5+5]

OR

3.a) Solve $y''+4y=0$, $y(0)=1$, $y'(0)=6$ using Laplace transform.

b) Solve the integral equation $f(t)=at+\int_0^t f(u)\sin(t-u)du$, $t>0$. [5+5]

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

b) Evaluate $\int_0^1 x^4\left(\log\frac{1}{x}\right)^3 dx$. [5+5]

OR

5.a) Prove that $\beta(m,n) = \frac{\sqrt{\pi}\,\Gamma(n)}{2^{2n-1}\Gamma(n+\frac{1}{2})}$

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

6. Evaluate $\iint_R xy\,dxdy$ where R is the region bounded by x-axis and x = 2a and the curve $x^2 = 4ay$. [10]

OR

7.a) Using triple integral, find the volume of the sphere whose radius is 'a' units.

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

8.a) Find Curl $\bar{F}$ at the point (1,2,3), given that $\bar{F} = grad(x^3y + y^3z + z^3x - x^2y^2z^2)$.

b) Find the Directional derivative of $\phi = x^4 + y^4 + z^4$ at the point A(1,-2,1) in the direction of AB where B is (2, 6, -1). [5+5]

OR

9.a) If the vector field $\bar{F} = (2xyz^2)i + (x^2z^2 + z\cos yz)\bar{j} + (2x^2yz + y\cos yz)\bar{k}$ is conservative then find its scalar potential function.

b) Prove that div $(r^n\bar{r}) = (n+3)r^n$ Where $r = |\bar{r}| = \sqrt{x^2+y^2+z^2}$ [5+5]

10.a) Use Divergence theorem to evaluate $\int_S \bar{F}.\bar{n}ds$ where F=3xi+3yj+3zk and surface of sphere is $x^2+y^2+z^2 = a^2$.

b) Calculate the work done by a force F= 3xy i - y^2 j in moving a particle in xy- plane from (0, 1) to (1, 2) along the parabola $y = x^2$. [5+5]

OR

11. Verify Stokes theorem for $F=(x^2+y^2)i-2xyj$ taken around a rectangle bounded by the lines x = a, x= -a, y = 0 and y = b. [10]

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