Code No: 131AB **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, May - 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) Find $L\{\cos^3 2t\}$. [2]

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

c) Evaluate $\int_0^1 x^7(1-x)^5\,dx$. [2]

d) Evaluate $\int_0^\infty x^4 e^{-x^2}\,dx$. [3]

e) Evaluate $\int_0^1\int_0^{\sqrt{x}} xy\,dy\,dx$. [2]

f) Evaluate $\int_{-1}^1\int_{-2}^2\int_{-3}^3 dx\,dy\,dz$. [3]

g) If $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$ then find $div\,\bar{r}$. [2]

h) State Green's theorem on a plane. [3]

i) Evaluate $\nabla\left(x^2 - yz + z^2\right)$. [2]

j) If $\bar{a}$ is a constant vector then find $curl(\bar{r}\times\bar{a})$. [3]

PART - B

(50 Marks)

2.a) Find $L\{te^{2t}\sin 3t\}$.

b) Find $L^{-1}\left\{\frac{s^2}{(s^2+4)(s^2+25)}\right\}$. [5+5]

OR

3. Solve the differential equation $\frac{d^2x}{dt^2} + 9x = \sin t$ using Laplace transform, given that $x(0)=1,\ x\left(\pi/2\right)=1$. [10]

4. Prove that $\beta(m,n)=\frac{\Pi(m).\Pi(n)}{\Pi(m+n)}$. [10]

OR

5. Show that $\beta\left(m,\frac{1}{2}\right)=2^{2m-1}\beta(m,m)$. [10]

6. Change the order of integration and solve $\int_0^a\int_{x^2/a}^{2a-x} xy^2\,dy\,dx$. [10]

OR

7. Find the area of the loop of the curve $r=a(1+\cos\theta)$. [10]

8.a) Prove that $\nabla.(\bar{A}\times\bar{B})=\bar{B}.(\nabla\times\bar{A})-\bar{A}.(\nabla\times\bar{B})$.

b) Find the directional derivative of $2x^2+z^2$ at (1, -1, 3) in the directional of $\bar{I}+2\bar{j}+3\bar{k}$. [5+5]

OR

9. Show that $\nabla^2[f(r)]=f''(r)+\frac{2}{r}f'(r)$ where $r=|\bar{r}|$. [10]

10. Verify Green's theorem for $\int_C (xy+y^2)dx+x^2dy$ where 'C' is bounded by $y = x$ and $y=x^2$. [10]

OR

11. Verify the Stoke's theorem for $\bar{F}=y\bar{i}+z\bar{j}+x\bar{k}$ and surface is the part of the plane $x^2+y^2+z^2=1$ above the xy - plane. [10]

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