MANIPAL ACADEMY of HIGHER EDUCATION

Question Paper - Report

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Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

COMPUTATIONAL MATHEMATICS - II [MAT 1272]

Marks: 30 **Duration: 90 mins.**

MCQ

Answer all the questions. Section Duration: 20 mins

1) The degree of homogeneous function

$$f(x,y)=\sqrt{\frac{x^{\frac{1}{2}}+y^{\frac{1}{2}}}{x^{\frac{1}{3}}+y^{\frac{1}{3}}}}$$

is ____ (0.5)

$\frac{1}{12}$ $\frac{1}{3}$ $\frac{1}{6}$ $\frac{1}{2}$

2) The percentage error in the area of a rectangle when an error of 1% is made in measuring its length and breadth is ____ (0.5)

2% 1% 0% 3%

3) The coefficient of y^3 in the Maclaurin's series expansion of $xy+\cos y$ is __ (0.5)

2 0 4 6

4) If $u=f(r,s)$ and $r=x+at,\ s=y+bt$, where a and b are constants, then $\frac{\partial u}{\partial t}=$ _____ (0.5)

$a\frac{\partial r}{\partial x}$ $a\frac{\partial r}{\partial x}+b\frac{\partial s}{\partial y}$ $a\frac{\partial u}{\partial x}+b\frac{\partial u}{\partial y}$ $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}$

5) The value of $\frac{\Gamma(7/2)}{\Gamma(5/2)}$ is (0.5)

3.5 4.5 2.5 1.4

6) The value of $\int_0^1 x^4\left(1-\sqrt{x}\right)^3\ dx$ is (0.5)

$2\beta(10,4)$ $\beta(10,4)$ $\beta(9,3)$ $2\beta(6,4)$

7) (0.5)

On changing to spherical polar coordinates, the integral
$\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dzdydx}{\sqrt{1-x^2-y^2-z^2}}$
is___

$\int_0^{2\pi} \int_0^{\frac{\pi}{2}} \int_0^1 \frac{r^2 \sin\theta}{\sqrt{1-r^2}} dr\, d\theta\, d\phi \int_0^{2\pi} \int_0^{\pi} \int_0^1 \frac{r^2 \sin\theta}{\sqrt{1-r^2}} dr\, d\theta\, d\phi \int_0^{\pi} \int_0^{\frac{\pi}{2}} \int_0^1 \frac{r^2 \sin\theta}{\sqrt{1-r^2}} dr\, d\theta\, d\phi \int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \int_0^1 \frac{r^2 \sin\theta}{\sqrt{1-r^2}} dr\, d\theta\, d\phi$

8) The value of the double integral
$\iint_R \frac{1}{\sqrt{x^2+y^2}} dxdy$
, where
R
is the region bounded by the circle
$x^2 + y^2 = 1$
is (0.5)

π 2π $\frac{\pi}{2}$ 0

9) The value of
$\int_{x=1}^{2} \int_{y=2}^{3} \int_{z=1}^{3} (x^2+1)\, dz\, dy\, dx$
is (0.5)

$\frac{10}{3}$ $\frac{20}{3}$ $\frac{22}{3}$ $\frac{20}{7}$

10) If
$u = x + y,\ v = 3x - 2y,$
then $\frac{\partial(x, y)}{\partial(u, v)}$ is ___ (0.5)

$-\frac{1}{5}$ -5 -1 1

DESCRIPTIVE

Answer all the questions.

11) Using triple integral, find the volume of the portion of sphere $x^2 + y^2 + z^2 = 9$ lying inside the cylinder $x^2 + y^2 = 3y$ above the xy -plane. (4)

12) Expand $f(x,y) = \tan^{-1}(xy)$ about the point $(1, 1)$ up to second degree terms. (3)

13) Find the extreme values of the function $f(x,y) = x^3 + y^3 - 63(x + y) + 12xy$. (3)

14) If $u = \sin^{-1}\left(\frac{x^2y^2}{x+y}\right)$, then prove that $x^2u_{xx} + 2xy\, u_{xy} + y^2u_{yy} = 3\tan u\,(3\tan^2 u + 2)$. (3)

15) Calculate the line of regression for the following data: (3)

x	0	25	50	75	100
y	14	38	54	76	95

16) Evaluate $\int_0^1 \int_y^{2-y} xy\, dxdy$ by changing the order of integration. (3)

17) Evaluate $\int_0^1 \int_0^{1-x} (y-x)^2 \sqrt{x+y}\ dydx$, using the transformations $x + y = u,\ y - x = v$. (3)

18) Use double integration to find the area of the region inside the circle $r = 4cos\theta$ and outside the circle $r = 2$. (3)

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