B.TECH. SEM -IV (CIVIL) 2014 COURSE (CBCS) : WINTER - 2017

SUBJECT: ENGINEERING MATHEMATICS – III

Day: **Monday**
Date: **20/11/2017**

W-2017-2068

Time: **02.30 PM TO 05.30 PM**
Max. Marks: 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat diagrams **WHEREVER** necessary.
4) Assume suitable data if necessary.

Q.1 a) Solve by method of variation of parameters: **(05)**
$(D^2-1)y = e^{-x}\sin\left(e^{-x}\right)+\cos\left(e^{-x}\right)$.

b) Solve: $\dfrac{dx}{x\left(2y^4-z^4\right)}=\dfrac{dy}{y\left(z^4-2x^4\right)}=\dfrac{dz}{z\left(x^4-y^4\right)}$. **(05)**

OR

Q.1 a) Solve: $\left(D^2+3D+2\right)y = e^{e^x}+\cos e^x$. **(05)**

b) Solve: $x^2\dfrac{d^2y}{dx^2}-3x\dfrac{dy}{dx}+5y = x^2\sin(\log x)$. **(05)**

Q.2 A cantilever beam of length l and weighing w lb/unit is subjected to a horizontal compressive force P applied at the free end. Taking the origin at the free end and y-axis upwards, establish the differential equation of the beam and hence find the maximum deflection. **(10)**

OR

Q.2 A tightly stretched string with fixed end points $x=0$ and $x=l$ is initially at rest in its equilibrium position. If it is vibrating by giving to each of its points a velocity $\lambda x(l-x)$, find the displacement of the string at any distance x from one end at any time t. **(10)**

Q.3 Solve the equations : **(10)**

$10x_1-2x_2-x_3-x_4=3$
$-2x_1+10x_2-x_3-x_4=15$
$-x_1-x_2+10x_3-2x_4=27$
$-x_1-x_2-2x_3+10x_4=-9$

By Gauss Seidel iteration method.

OR

Q.3 Apply Runge–Kutta method to find an approximate value y for $x=0.2$ in steps of 0.1, if $\dfrac{dy}{dx}=x+y^2$, given that $y=1$, where $x=0$. **(10)**

P. T. O.

Q.4 a) A can hit a target 3 times in 5 shots, B 2 times, in 5 shorts and C 3 time in 4 shots. They fire a volley. What is the probability that: **(05)**

i) two shot hit ii) at least two shots hit?

b) In a sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain at least 3 defective parts. **(05)**

OR

Q.4 In the following table are recorded data showing the test scores made by salesman on an intelligence test and their weekly sales: **(10)**

Salesman	1	2	3	4	5	6	7	8	9	10
Test scores	40	70	50	60	80	50	90	40	60	60
Sales (000)	2.5	6.0	4.5	5.0	4.5	2.0	5.5	3.0	4.5	3.0

Calculate the regression line of the sales on test scores and estimate the most probable weekly sales volume if a salesman makes a score of 70.

Q.5 a) Show that the vector field $f(r)\bar{r}$ is always irrotational and determine $f(r)$ such that the field is solenoidal also. **(05)**

b) Show that: $\nabla^4\left(r^2 \log r\right)=\frac{6}{r^2}$. **(05)**

OR

Q.5 a) Find the directional derivative of $\phi = e^{2x}\cos yz$ at $(0,0,0)$ in the direction of tangent to the curve $x = a\sin t,\ y = a\cos t,\ z = at$ at $t=\frac{\pi}{4}$. **(05)**

b) For a solenoidal vector field $\bar{E}$, show that CurlCurlCurlCurl $\bar{E}=\nabla^4\bar{E}$. **(05)**

Q.6 a) Evaluate: $\oint_0 \left(\cos y\,\hat{i} + x(1-\sin y)\,\hat{j}\right)\bullet d\bar{r}$ for a closed curve which is given by $x^2+y^2=1,\ z=0$. **(05)**

b) Apply stoke's theorem to calculate: **(05)**

$\int_C 4ydx + 2zdy + 6ydz$ where C is the curve of intersection of $x^2+y^2+z^2=6z$ and $z=x+3$.

OR

Q.6 Verify divergence theorem for: **(10)**

$\bar{F}=4xz\,\hat{i}+xyz^2\,\hat{j}+3z\,\hat{k}$ over the region above the xoy plane bounded by the cone $z^2=x^2+y^2$ and the plane $z=4$.

* * * *