B.TECH. SEM -IV (CIVIL) 2014 COURSE (CBCS) : SUMMER - 2018

SUBJECT: ENGINEERING MATHEMATICS – III

Day: **Saturday**
Date: **02/06/2018**

S-2018-2276

Time: **10.00 AM TO 01.00 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 parameters : $\left(D^2+9\right)y=\dfrac{1}{1+\sin 3x}$ **(05)**

b) Solve: $\dfrac{dx}{3z-4y}=\dfrac{dy}{4x-2z}=\dfrac{dz}{2y-3x}$ **(05)**

OR

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

b) Solve: $(2x+3)^2\dfrac{d^2y}{dx^2}-2(2x+3)\dfrac{dy}{dx}-12y=6x$ **(05)**

Q.2 A horizontal tie rod of length l freely pinned at its ends carries uniformly distributed load W per meter run and is subjected to a horizontal tension T. Show that the maximum deflection is **(10)**

$$\frac{W}{n^2T}\left(\sec h\frac{nl}{2}-1\right)+\frac{Wl^2}{8T}$$

and maximum bending moment is $\dfrac{W}{n^2}\left(\sec h\dfrac{nl}{2}-1\right)$ where $n^2=\dfrac{T}{EI}$.

Also solve above , if the horizontal thrust at each end is P.

OR

Q.2 Solve: $\dfrac{\partial u}{\partial t}=\dfrac{\partial^2 u}{\partial x^2}$ if **(10)**

i) u is finite for all t.
ii) $u=0$ when $x=0,\ \pi$ for all t .
iii) $u=\pi x-x^2$, when $t=0$ and $0\le x\le \pi$.

Q.3 Using modified Euler's method, find an approximate value of y when $x=0.3$, given that $\dfrac{dy}{dx}=x+y$ and $y=1$ when $x=0$. **(10)**

OR

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

$$10x-7y+3z+5u=6$$
$$-6x+8y-z-4u=5$$
$$3x+y+4z+11u=2$$
$$5x-9y-2z+4u=7$$

By Gauss elimination method.

P. T. O.

Q.4 Calculate the first four moments about the mean of the given distribution. Also find β_1 and β_2. **(10)**

X	2.0	2.5	3.0	3.5	4.0	4.5	5.0
f	4	36	60	90	70	40	10

OR

Q.4 a) A problem on mathematics is given to the three students A,B and C where chances of solving it are $\frac{1}{2}, \frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that problem will be solved? **(05)**

b) There are there bags: first containing 1 white, 2 red, 3 green balls; second 2 white, 3 red, 1 green balls and third 3 white, 1 red, 2 green balls. Two balls are drawn from a bag chosen at random. These are found to be one white and one red, find the probability that balls are draw came from the second bag. **(05)**

Q.5 a) Find the directional derivative of function $\phi = e^{2x-y-z}$ at (1, 1, 1) in the direction of the tangent to the curve $x = e^{-t}, y = 2\sin t + 1, z = t - \cos t$ at $t = 0$. **(05)**

b) Show that: $\nabla \bullet \left[r \nabla \left(\frac{1}{r^n} \right) \right] = \frac{n(n-2}{r^{n+1}}$. **(05)**

OR

Q.5 a) If $\rho \overline{E} = \nabla \phi$, prove that $\overline{E} \bullet \text{curl } \overline{E} = 0$. **(05)**

b) Show that: $\overline{F} = (6xy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (3x\, z^2 - y)\hat{k}$ is irrotational. Find scalar ϕ such that $\overline{F} = \nabla \phi$. **(05)**

Q.6 a) Find the work done in moving particle once round the ellipse **(05)**
$\frac{x^2}{25} + \frac{y^2}{16} = 1, \ z = 0$ under the field of force given by
$\overline{F} = (2x - y + z)\hat{i} + (x + y - z^2)\hat{j} + (3x - 2y + 4z)\hat{k}$.

b) Show that: $\iiint_V \frac{dv}{r^2} = \iint_S \frac{\overline{r} \bullet \hat{n}}{r^2}\, ds$. **(05)**

OR

Q.6 Verify stokes theorem for **(10)**
$\overline{F} = (y - z + 2)\hat{i} + (yz + 4)\hat{j} - xz\hat{k}$ over the surface of a cube.
$x = 0, \ y = 0, \ z = 0, \ x = 2, \ z = 2$
above the *xoy* plane (open at the bottom).

* * * *