CBCS SCHEME

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Third Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Mathematics – III

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Obtain the Fourier series of $f(x) = x(2\pi - x)$ in $0 \le x \le 2\pi$.   (08 Marks)

   b. Obtain the Fourier series for the function $f(x) = \begin{cases} 1 + 4\dfrac{x}{3} & \text{in } -\dfrac{3}{2} < x \le 0 \\ 1 - 4\dfrac{x}{3} & \text{in } 0 \le x < \dfrac{3}{2} \end{cases}$ (06 Marks)

   c. Expand $f(x) = 2x - 1$ as a Cosine half range Fourier series in $0 < x < 1$.   (06 Marks)

OR

2 a. Obtain the constant term and the coefficients of the first Cosine and Sine terms in the Fourier expansion of 'y' from the table

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(08 Marks)

   b. Obtain the Fourier series of $f(x) = |x|$ in $-\pi \le x \le \pi$.   (06 Marks)

   c. Show that the sine half range series for the function $f(x) = \ell x - x^2$ in $0 < x < \ell$ is

$$\frac{8\ell^2}{\pi^3} \sum_0^\infty \frac{1}{(2n+1)^3} \operatorname{Sin}\left(\frac{2n+1}{\ell}\right)\pi x .$$ (06 Marks)

Module-2

3 a. If $f(x) = \begin{cases} 1 & \text{for } |x| \le a \\ 0 & \text{for } |x| > a \end{cases}$, find the infinite Fourier transform of $f(x)$ and hence evaluate

$$\int_0^\infty \frac{\operatorname{Sin} x}{x} dx .$$ (08 Marks)

   b. Find the Fourier Cosine transform of e^{-x}.   (06 Marks)

   c. Solve by using Z-transforms: $y_{n+2} - 4y_n = 0$, given $y_0 = 0$ and $y_1 = 2$.   (06 Marks)

OR

4 a. Find the Fourier Sine transform of $\dfrac{e^{-ax}}{x}, a > 0$.   (08 Marks)

   b. Find the Z-transform of $\operatorname{Sin}(3n + 5)$.   (06 Marks)

   c. Find the inverse Z-transform of $\dfrac{2z^2 + 3z}{(z+2)(z-4)}$.   (06 Marks)

Module-3

5 a. Find the coefficient of correlation for the data

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

(08 Marks)

b. Fit a straight line to the following data

Year	1961	1971	1981	1991	2001
Production (in tons)	8	10	12	10	16

(06 Marks)

c. Compute the real root of $x \log_{10} x - 1.2 = 0$ by Regula – Falsi method. Carry out three iterations in (2, 3). (06 Marks)

OR

6 a. Obtain the lines of Regression for the following values of x and y

x	1	2	3	4	5
y	2	5	3	8	7

(08 Marks)

b. Fit an exponential curve of the form $y - ae^{bx}$ for the following data

No. of petals	5	6	7	8	9	10
No. of flowers	133	55	23	7	2	2

(06 Marks)

c. Find a real root of $x \, Sinx + Cosx = 0$ near $x = \pi$. Correct to four decimal places, using Newton – Raphson method. (06 Marks)

Module-4

7 a. Given Sin 45° = 0.7071, Sin 50° = 0.7660, Sin 55° = 0.8192, Sin 60° = 0.8660, find Sin 57° using an appropriate interpolation formula. (08 Marks)

b. Use Newton's divided difference formula to find f(4) given the data

x	0	2	3	6
f(x)	–4	2	14	158

(06 Marks)

c. Using Simpsons $1/3^{rd}$ rule, evaluate $\int_{0}^{\pi/2} \sqrt{Cos\,\theta}\; d\theta$ by dividing [0, π/2] in to 6 equal parts.

(06 Marks)

OR

8 a. From the following table find the number of students who have obtained less than 45 marks

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	31	42	51	35	31

(08 Marks)

b. Using Lagrange's interpolation formula fit a polynomial of the form x = f(y)

x	2	10	17
y	1	3	4

(06 Marks)

c. Evaluate $\int_{0}^{1} \dfrac{x}{1+x^2} dx$ by Weddle's rule taking seven ordinates. (06 Marks)

Module-5

9 a. Verify Green's theorem in a plane for $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where 'C' is the boundary of the region enclosed by $y = \sqrt{x}$ and $y = x^2$. **(08 Marks)**

   b. Verify Stoke's theorem for $\vec{F} = (x^2 + y^2)i - 2xyj$ taken round the rectangle bounded by the lines $x = \pm a$, $y = 0$ and $y = b$. **(06 Marks)**

   c. Derive Euler's equation $\dfrac{\partial t}{\partial y} - \dfrac{d}{dx}\left[\dfrac{\partial t}{\partial y^1}\right] = 0$. **(06 Marks)**

OR

10 a. Use Gauss divergence theorem to evaluate $\iint_S \vec{F} \cdot \hat{n}\,ds$ over the entire surface of the region above xy plane bounded by the cone $z^2 = x^2 + y^2$ the plane $z = 4$ where $\vec{F} = 4xz\,i + xy\,z^2 j + 3z\,K$. **(08 Marks)**

   b. Prove that geodesics of a plane are straight lines. **(06 Marks)**

   c. Find the extremal of the functional $\int_0^{\pi/2} (y^2 - y'^2 - 2y\,Sinx)dx$ under the end conditions $y(0) = y(\pi/2) = 0$. **(06 Marks)**

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Third Semester B.E. Degree Examination, Jan./Feb. 2021
Additional Mathematics - I

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Find the modulus and amplitude of $\dfrac{(1+i)^2}{3+i}$. **(06 Marks)**

   b. If $x + \dfrac{1}{x} = 2\cos\alpha$, then prove that $x^n + \dfrac{1}{x^n} = 2\cos n\alpha$. **(07 Marks)**

   c. Find the fourth roots of $1 - \sqrt{3}$ and represent them on an argand plane. **(07 Marks)**

OR

2 a. If the vectors $2\hat{i} + \lambda\hat{j} + \hat{k}$ and $4\hat{i} - 2\hat{j} - 2\hat{k}$ are perpendicular to each other than find the value of λ. **(06 Marks)**

   b. Find the sine of the angle between the vectors $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 2\hat{k}$. **(07 Marks)**

   c. Find λ such that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + \lambda\hat{j} + 5\hat{k}$ are coplanar. **(07 Marks)**

Module-2

3 a. Find the nth derivative of $\cos x \cos 2x \cos 3x$. **(06 Marks)**

   b. With usual notations prove that $\operatorname{Tan}\phi = r\dfrac{d\theta}{dr}$. **(07 Marks)**

   c. Prove that $\sqrt{1 + \sin 2x} = 1 + x - \dfrac{x^2}{2} - \dfrac{x^3}{3} + \dfrac{x^4}{24} + \ldots\ldots$ By using Maclaurin's expansion. **(07 Marks)**

OR

4 a. If $u = \operatorname{Tan}^{-1}\left(\dfrac{x^3 + y^3}{x - y}\right)$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \sin 2u$. **(06 Marks)**

   b. If $u = f\left(\dfrac{x}{y}, \dfrac{y}{z}, \dfrac{z}{x}\right)$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + z\dfrac{\partial u}{\partial z} = 0$. **(07 Marks)**

   c. If $u = e^x \cos y$, $v = e^x \sin y$, find $J = \dfrac{\partial(u, v)}{\partial(x, y)}$. **(07 Marks)**

Module-3

5 a. Evaluate $\displaystyle\int_0^\pi x\cos^6 x \, dx$. **(06 Marks)**

   b. Evaluate $\displaystyle\int_0^1 \int_0^1 \dfrac{dx \, dy}{\sqrt{(1 - x^2)(1 - y^2)}}$. **(07 Marks)**

   c. Evaluate $\displaystyle\int_0^1 \int_0^2 \int_1^2 x^2 y z \, dx \, dy \, dz$. **(07 Marks)**

OR

6 a. Evaluate $\int \sin^6 x \, dx$. (06 Marks)

b. Evaluate $\iint\limits_{R} (x^2 + y^2) \, dx \, dy$, where R is the triangle bounded by the lines $y = 0$, $y = x$ and $x = 1$. (07 Marks)

c. Evaluate $\int\limits_{0}^{1} \int\limits_{0}^{1} \int\limits_{0}^{1} e^{x+y+z} \, dx \, dy \, dz$. (07 Marks)

Module-4

7 a. A particle moves along a curve whose position vector is given by $\vec{r} = \left(t - \dfrac{t^3}{3}\right)\hat{i} + t^2\hat{j} + \left(t + \dfrac{t^3}{3}\right)\hat{k}$. Find the velocity and acceleration at $t = 3$. (06 Marks)

b. Find the unit normal vector to the surface $xy + x + zx = 3$ at $(1, 1, 1)$. (07 Marks)

c. Find div $\vec{F}$ and curl $\vec{F}$, where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. (07 Marks)

OR

8 a. A particle moves so that its position vector is given by $\vec{r} = \cos wt\, \hat{i} + \sin wt\, \hat{j}$, where w is a constant. Show that the velocity $\vec{V}$ is perpendicular to $\vec{r}$. (06 Marks)

b. If $\vec{F} = (x + y + 1)\, \hat{i} + \hat{j} - (x + y)\, \hat{k}$, show that $\vec{F}$ curl $\vec{F} = 0$. (07 Marks)

c. Show that $\vec{f} = (\sin y + z)\, \hat{i} + (x \cos y - z)\, \hat{j} + (x-y)\, \hat{k}$ is irrotational. Also find ϕ such that $\vec{f} = \nabla\phi$. (07 Marks)

Module-5

9 a. Solve $\dfrac{dy}{dx} = 1 + \dfrac{y}{x} + \left(\dfrac{y}{x}\right)^2$. (06 Marks)

b. Solve $\dfrac{dy}{dx} + y \cot x = \sin x$. (07 Marks)

c. Solve $(x^2 + y)dx + (y^3 + x)\, dy = 0$. (07 Marks)

OR

10 a. Solve $\dfrac{dy}{dx} + \dfrac{y}{x} = y^2 x$. (06 Marks)

b. Solve $(y \cos x + \sin y + y)\, dx + (\sin x + x \cos y + x)\, dy = 0$. (07 Marks)

c. Solve $y^2 + x^2 \dfrac{dy}{dx} = xy\dfrac{dy}{dx}$. (07 Marks)

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Third Semester B.E. Degree Examination, Jan./Feb. 2021
Analog and Digital Electronics

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   Explain with the constructional details and characteristics curves, the working of n-channel JFET. **(08 Marks)**
    b.   Define the following op-amp parameters: (i) CMRR   (ii) Slew Rate **(04 Marks)**
    c.   With circuit diagram, explain the operation of Astable Multivibrator using IC 555. **(08 Marks)**

OR

2   a.   Design a voltage divider bias network using DE-MOSFET with supply voltage $V_{DD} = 16$ V, $I_{DSS} = 10$ mA, Vp $= -5$V to have Quiscent drain current of 5 mA and gate voltage of 4V (assume the drain resistance R_D to be 4 times the source resistor R_S) **(08 Marks)**
    b.   List the Ideal characteristics of op-amp. **(04 Marks)**
    c.   With circuit diagram and waveforms, explain the working of Relaxation Oscillator. **(08 Marks)**

Module-2

3   a.   Explain positive logic and negative logic. **(07 Marks)**
    b.   Use K-map to simplify the following functions:
         (i) $f(A, B, C, D) = \Sigma m(0, 2, 6, 10, 11, 12, 13) + d(3, 4, 5, 14, 15)$
         (ii) $f(A, B, C, D) = \pi M(1, 2, 4, 5, 6, 7, 8, 10, 11, 13, 14)$ **(06 Marks)**
    c.   Explain Static-1 Hazard and Hazard cover with an example. **(07 Marks)**

OR

4   a.   Write HDL code for the Boolean expression Y = AB + CD. **(08 Marks)**
    b.   Get the simplified expression of, $Y(A, B, C, D) = \Sigma m(0, 1, 3, 7, 8, 9, 11, 15)$. Using Quine Mc Clustery method. **(12 Marks)**

Module-3

5   a.   Show how two 1:16 deMUX can be connected to get 1:32 deMUX. **(10 Marks)**
    b.   With IEEE symbol, logic symbol, explain NAND gate SR latch. Justify the Truth Table. **(10 Marks)**

OR

6   a.   Explain the positive edge triggered JK flipflop. **(10 Marks)**
    b.   List the differences between PAL and PLA. Explain 7-segment decoder using PLA. **(10 Marks)**

Module-4

7   a.   What are the various ways of representing flip flop? Explain the various representation of JK, SR, D, T flip flop. **(10 Marks)**
    b.   Define Register. Explain SISO using four D- flip flops. Assume initial values of 4 flip flop QRST as 1010, write truth table and plot waveforms. **(10 Marks)**

OR

8 a. Design mod-3 counter using JK flip flop. Also draw state diagram and write the truth table.

(10 Marks)

b. Explain Linear Feedback Shift Register [LFSR] for the polynomial $x^4 + x^3 + 1$. (10 Marks)

Module-5

9 a. Explain Digital Clock with block diagram. (10 Marks)

b. What is Binary ladder? Explain Binary ladder with digital input of 1000. (10 Marks)

OR

10 a. Explain Successive Approximation A/D converter. (10 Marks)

b. Write short note on A/D Accuracy and Resolution. (04 Marks)

c. Design mod-5 counter using JK flip flops. Write the truth table and draw the waveforms.

(06 Marks)

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Third Semester B.E. Degree Examination, Jan./Feb. 2021
Unix and Shell Programming

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. What is Operating System? With a diagram, explain the architecture of UNIX OS. (08 Marks)
  b. Explain the following commands with examples :
     i) echo   ii) ls   iii) who   iv) date   v) tty   vi) man.   (06 Marks)
  c. Differentiate between External and Internal commands in UNIX with suitable examples.
     (06 Marks)

OR

2 a. Explain the contents of /etc/passwd and /etc/shadow files with respect to UNIX OS.
     (08 Marks)
  b. Explain the Commands used to add , modify and delete a user with examples.   (06 Marks)
  c. Write a note on man documentation and explain the keyword option.   (06 Marks)

Module-2

3 a. With the help of a diagram, explain the Parent – Child relationship in UNIX file system.
     (06 Marks)
  b. Briefly explain the different types of files supported in UNIX.   (06 Marks)
  c. What is Pathname? Describe the different types of Pathnames, with suitable examples.
     (08 Marks)

OR

4 a. Which command is used for listing file attributes? Explain the significance of each field in
     the output.   (08 Marks)
  b. Assuming that a files current permission are rw – r – xr - -. Write the chmod expressions
     required to change them for the following : i) rwxrwxrwx   ii) r - - r - - - -
     iii) - - - r - - - - -   iv) - - - - - - - - - .
     Using both Relative and Absolute methods of assigning permissions.   (08 Marks)
  c. Explain the following commands with example :
     i) cat   ii) mv   iii) rm   iv) cp.   (04 Marks)

Module-3

5 a. Explain the three different modes in which vi editor works and explain how you can switch
     from one mode to another.   (10 Marks)
  b. List and explain the navigation commands in vi editor with example.   (06 Marks)
  c. Explain what these wild – card pattern match :
     i) [A – Z] ? ? ? ?*   ii) *[! 0 – 9]*   iii) *. [!s] [!h]   iv) [!a – z A – Z]*.
     (04 Marks)

OR

6 a. Explain the standard input, standard output and standard error with respect to UINX OS.

(10 Marks)

b. With suitable examples, explain the grep command and its various options. (06 Marks)

c. Explain Shell's Interpretive cycle. (04 Marks)

Module-4

7 a. Explain the shell features of 'while' and 'for' with syntax. (08 Marks)

b. Explain the special parameters used by the shell. (06 Marks)

c. Distinguish between hard link and soft link, with suitable examples. (06 Marks)

OR

8 a. Write a shell program to create a menu and execute a given options based on user choice. Options include i) List of users ii) List of processes iii) Current date and iv) Quit to UNIX. (08 Marks)

b. Explain the following commands with example :
i) head ii) tail iii) cut iv) paste. (06 Marks)

c. Briefly explain the sort command with its options. (06 Marks)

Module-5

9 a. Explain the three distinct phases of process creation. And explain how shell is created.

(08 Marks)

b. Use find command to locate from home directory :
i) All files within the extension .html.
ii) All files having inode number 1006.
iii) All directories having permissions 777.
iv) All files not accessed for more than a year.
v) All but the C program files.
vi) All files named a.out and all 'c' source files and remove them interactively. (06 Marks)

c. Explain the nice command with example. (06 Marks)

OR

10 a. Explain the following string handling functions of PERL with examples :
i) length ii) index iii) substr iv) reverse. (08 Marks)

b. Write a PERL program to determine whether the given year is a leap year or not. (08 Marks)

c. With examples, briefly explain split and join functions in PERL. (04 Marks)

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