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<b>R-17</b>
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**Code: 7GC32**

II B.Tech. I Semester Supplementary Examinations February 2022

**Engineering Mathematics-III**  
( Common to All Branches )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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<b>UNIT-I</b>
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1. a) Apply fourth order Runge-Kutta method to  $\frac{dy}{dx} = 3x + \frac{1}{2}y$ ,  $y(0) = 1$  determine  $y(0.1)$  correct to four decimal places. 7M

b) Find a real root of the equation  $3x = \cos x + 1$  by Newton-Raphson's method correct to four decimal places. 7M

**OR**

2. Find a real root of the equation  $3x = \cos x + 1$  by Newton-Raphson's method correct to four decimal places. 14M

<b>UNIT-II</b>
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3. a) Using Newton's forward interpolation formula and the given table of values

x	1.1	1.3	1.5	1.7	1.9
F(x)	0.21	0.69	1.25	1.89	2.61

Obtain the value of f(x) when  $x = 1.2$  7M

b) Find the first and second derivatives of the function tabulated below at the point  $x = 1.5$

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24.0	38.875	59.0

7M

**OR**

4. The following table of values of x and y is given.

x	0	1	2	3	4	5	6
y	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309

Find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at  $x=6$  14M

<b>UNIT-III</b>
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5. Form the partial differential equation by eliminating the arbitrary constants  $x^2 + y^2 + (z - c)^2 = a^2$  14M

**OR**

6. a) Form a partial differential equation by eliminating the arbitrary functions from  $z = f(x + at) + g(x - at)$ . 7M
- b) Solve  $(x^2 - yz)p + (y^2 - zx)q = (z^2 - xy)$  7M

## UNIT-IV

7. a) Find the Fourier series to represent  $f(x) = f x$  in  $0 \leq x \leq 2$  7M
- b) Find the half range cosine series for the function  $f(t) = t - t^2$ , in  $0 < t < 1$  7M

**OR**

8. a) Find the Fourier series to represent  $f(x) = |x|$  when  $-f < x < f$  and deduce that  $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{f^2}{8}$  7M
- b) Find the half range cosine series for the function  $f(x) = x$ , when  $0 < x < f$  hence show that  $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{f^2}{8}$  7M

## UNIT-V

9. a) Find the Fourier cosine transform of  $f(x) = e^{-ax}$  ( $x > 0, a > 0$ ). 7M
- b) Find the Fourier transform of  $f(x)$  given by  $f(x) = \begin{cases} 1, & \text{for } |x| < 1 \\ 0, & \text{for } |x| > 1 \end{cases}$  hence evaluate  $\int_0^{\infty} \frac{\sin x}{x} dx$  7M

**OR**

10. Find the finite Fourier sine and cosine transforms of  $f(x)$  defined by

$$f(x) = \begin{cases} 1, & 0 < x < \frac{f}{2} \\ -1, & \frac{f}{2} < x < f \end{cases}$$

14M

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**Code: 7G333**

II B.Tech. I Semester Supplementary Examinations February 2022

**Signals and Systems**

(Electronics and Communication Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

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Marks

<b>UNIT-I</b>
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- 1. a) Define Fourier series of signal f(t) .Derive the Relationship between various types of Fourier series representation 7M
- b) Differentiate clearly between the even, odd and half wave symmetry waveforms with respect to their Fourier coefficients (use appropriate waveform) in their Fourier series representation 7M

**OR**

- 2. a) Write the Classification of systems based on certain properties. 7M
  - b) Determine whether the following signals are energy signals or power signals and calculate their energy or power 7M
- i)  $x(n) = (\frac{1}{2})^n u(n)$  ii)  $x(t) = \cos^2 \xi_0 t$

<b>UNIT-II</b>
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- 3. a) State and prove Differentiation and integration properties of Fourier Transform. 7M
- b) What is the Significance of Hilbert Transform? Explain 7M

**OR**

- 4. a) Find the Fourier transform of DC Signal 7M
- b) State and prove Time Convolution property of Fourier Transform. 7M

<b>UNIT-III</b>
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- 5. a) Prove that bandwidth and rise time of an LTI system are inversely proportional to each other. 7M
- b) Discuss the conditions for distortionless transmission. 7M

**OR**

- 6. a) The output response of a continuous time LTI system is  $2e^{-3t}u(t)$  when the input x(t) is u(t) find the Transfer function. 7M
- b) Determine whether the following systems are Linear or Nonlinear, Shift variant or Invariant, Causal or Non-causal, Stable or unstable. (i)  $y(t) = x(t+10) + x^2(t)$  (ii)  $dy(t)/dt + 10 y(t) = x(t)$  7M

<b>UNIT-IV</b>
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- 7. a) Derive the relation between PSDs of input and output for an LTI system 7M
- b) State and prove any four properties of Cross correlation function 7M

**OR**

- 8. a) State and explain Parseval's theorem. 7M
- b) Explain about the properties of LTI system 7M

<b>UNIT-V</b>
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- 9. a) Find the Laplace transform of the signal  $x(t) = e^{-at} u(t) + e^{-bt} u(t)$  7M
- b) Explain the Concept of region of convergence (ROC) for Laplace transforms 7M

**OR**

- 10. a) Prove the differentiation property of Z-transform. Explain the concept of ROC in Z transform 7M
- b) Give the relationship between z-transform ,Fourier transform and Laplace Transform 7M

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**Code: 7G332**

II B.Tech. I Semester Supplementary Examinations February 2022

**Digital Design**

(Electronics and Communication Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks )

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- |  | Marks |
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| <b>UNIT-I</b>  |       |
| 1. a) Write a short note on logic gates and their truth tables   | 10M   |
| b) List out the properties of XOR gate   | 4M    |
| <b>OR</b>  |       |
| 2. a) Represent +25,-25 and -52 in 1's and 2's compliment forms  | 7M    |
| b) State and prove the De-Morgan's theorems  | 7M    |
| <b>UNIT-II</b>   |       |
| 3. a) What is meant by Don't care combinations and simplify the given Boolean function (F) together with the Don't cares (d) $F(x,y,z) = (0,1,2,4,5)+d(3,7)$ | 7M    |
| b) Simplify the given Boolean function and realize using NOR gates.<br>$F(a,b,c,d) = (1,3,5,7,9,11,13)$  | 7M    |
| <b>OR</b>  |       |
| 4. a) Define prime implicants, essential prime implicants and selective implicants   | 8M    |
| b) Differences between canonical and standard form of Boolean functions  | 6M    |
| <b>UNIT-III</b>  |       |
| 5. a) Implement given function using 8X1 multiplexer $F = (0,1,5,6,7)$   | 7M    |
| b) Design a circuit which convert given 4-bit gray code to binary code   | 7M    |
| <b>OR</b>  |       |
| 6. Implement given functions using PAL<br>$F1(a,b,c) = (1,2,3,4)$ $F2(a,b,c) = (1,3,5,7)$ $F3(a,b,c) = (0,5,6,7)$  | 14M   |
| <b>UNIT-IV</b>   |       |
| 7. a) Compare synchronous and asynchronous circuits  | 6M    |
| b) Define excitation table, state table and state diagram  | 8M    |
| <b>OR</b>  |       |
| 8. a) With a neat diagram explain operation of 4-bit UP/DOWN counter   | 10M   |
| b) Explain various triggering methods  | 4M    |
| <b>UNIT-V</b>  |       |
| 9. a) List out the salient features of the ASM chart   | 8M    |
| b) Draw the ASM chart for MOD-3 counter  | 6M    |
| <b>OR</b>  |       |
| 10. Determine a minimal state table equivalent to the given state table using partition technique method   |       |

PS	NS,Z	
	X=0	X=1
1	1,0	1,0
2	1,1	4,1
3	4,0	5,0
4	1,1	5,0
5	2,0	3,0

14M

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4. a) Find the power delivered and current from a sinusoidal voltage source with  $V=220$  V to an impedance of  $Z=(6+j8)$  . 6M
- b) Explain about different Types of Wave Forms and also Importance of Sinusoidal Wave Form. 8M

**UNIT-III**

5. Explain with defining equations about (i) y-parameters; (ii) z-parameters; (iii) ABCD-parameters; (iv) h-parameters. 14M

**OR**

6. a) What are the transmission parameters? Deduce the relation  $A^2 - BC=1$  for a symmetrical and reciprocal four terminal network. 7M
- b) The z parameters of a symmetrical four terminal network are  $z_{11}=z_{22}=20$  and  $z_{12}=z_{21}=5$  . Find the ABCD parameters of the network 7M

**UNIT-IV**

7. a) Describe the principle of operation of a dc generator? 7M
- b) A 2 pole lap wound generator has 200 conductors on armature. It is driven by prime mover at a constant speed of 600 rpm. If the flux per pole is 0.1 Wb, calculate the generated emf. 7M

**OR**

8. a) Explain the speed-torque characteristics of dc shunt and dc series motors 8M
- b) Explain the various losses which take place in a dc machine. 6M

**UNIT-V**

9. a) Explain in detail the construction of a 3-phase induction motor specifying in detail the squirrel cage and slip ring motor construction. 10M
- b) Write the principle of Induction motor. 4M
- OR**
10. a) Explain with the help of suitable diagram how the rotating magnetic field is produced in a three phase motor? 10M
- b) What is the relationship between the supply frequency number of poles and synchronous speed? 4M

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