

Duration : 3 Hours

Max. Marks : 80

N.B. 1) Question No. 1 is compulsory .

2) Attempt any three questions out of the remaining five questions .

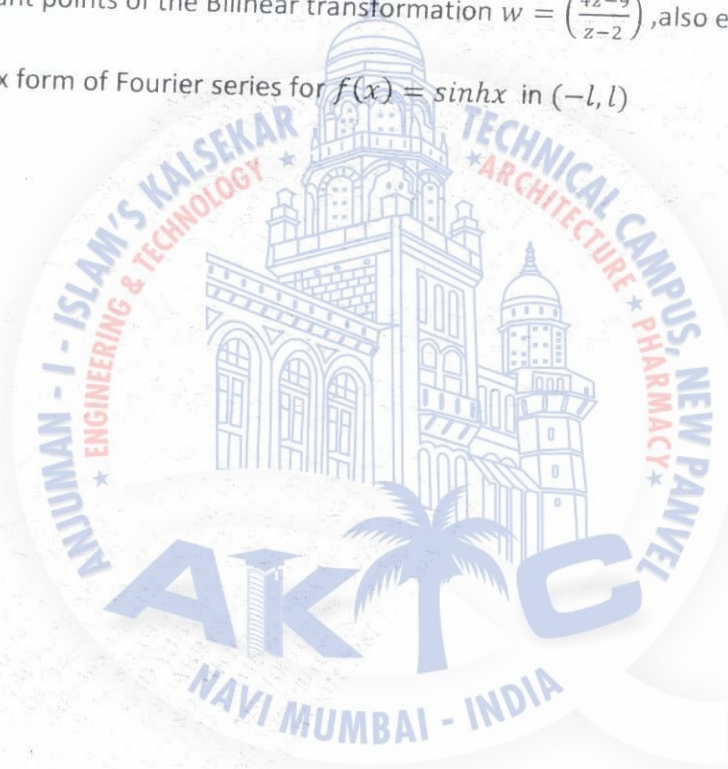
3) Figures to the right indicate full marks .

1. (a) Find  $L \left\{ \frac{d}{dt} \left( \frac{\sin 4t}{t} \right) \right\}$  5  
 (b) Find the Fourier series for  $f(x) = 5x^2$  in  $(-\pi, \pi)$  5  
 (c) Show that the vector  $\vec{F} = \frac{-y\mathbf{i} + x\mathbf{j}}{x^2 + y^2}$  is irrotational. 5  
 (d) Determine constant a,b,c,d if  
 $f(z) = (10x^2 + ay^2 + 8bxy) + i(5cxy + 7dx^2 + 2x^2)$  is analytic. 5
2. (a) Prove that  $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$  6  
 (b) Solve using Laplace transform  $(D^3 - 3D - 2)y = 590.t^3.e^{3t}$   
 $y(0) = 0, y'(0) = 0, y''(0) = 0$  6  
 (c) Find half range cosine series for  $\cos \alpha x$  in  $(0, \pi)$ , where  $\alpha$  is  
 not an integer and hence show that  $\sum_{n=1}^{\infty} \frac{1}{\alpha^2 - n^2} = \frac{\alpha \pi \cot \alpha \pi}{1 + 2\alpha^2}$  8
3. (a) If  $u = (x^2 + y^2 + z^2)$  Prove that  $\text{Curl}(\text{grad } u) = \vec{0}$ . 6  
 (b) Find Fourier for  $f(x) = x - x^2$  in  $(0, 2\pi)$ . 6  
 (c) Evaluate  $\int_0^{\infty} e^{-4t} \int_0^t (u \sinh^2 u)^2 \cdot \cosh 5u e^{3u} du \cdot dt$  8
4. (a) Find the bilinear transformation which maps the points  
 $z = 1, i, -1$  onto the points  $w = i, 0, -i$ . 6  
 (b) By using Stoke's theorem evaluate  $\int_C \vec{F} \cdot \vec{dr}$  where  
 $\vec{F} = (8x + 2y)\mathbf{i} - 4z^2\mathbf{j} - y^2z\mathbf{k}$  and C is the boundary of the  
 hemisphere  $x^2 + y^2 + z^2 = a^2, z = 0$ . 6  
 (c) Find Inverse Laplace transform  
 i)  $\left\{ \frac{5s+3}{s^2+6s+25} \right\}$  ii)  $\log \left\{ \frac{s^2+64}{s^2+16} \right\}$  8

TURN OVER

## Q.P. Code: 24961

5. (a) Define Orthogonal set of functions on (a,b), Show that the functions  $f_1(x) = 1$ ,  $f_2(x) = 3x$  are orthogonal on (-2,2). Determine the constants P, Q such that  $f_3(x) = Px^2 + Qx + 9$  is orthogonal to both  $f_1(x)$  &  $f_2(x)$  on the same interval. 6
- (b) Find the analytic function  $f(z) = u + iv$  in terms of Z if  $3u - 7v = x^3 + x^2 - 3xy^2 - y^2 - 3yx^2 + y^3 - 2xy$ . 6
- (c) Verify Green's theorem for  $\int_C (4xy - x^2)dx + (2x + 6y^2)dy$ , C is the closed curve in the XY-plane bounded by  $y = x^2$  and  $x = y^2$ . 8
6. (a) Find Laplace transform of  $f(x) = \begin{cases} \sin 7t & 0 < t < \pi/2 \\ 2 & \pi/2 < t < \pi \end{cases}$  and  $f(t) = f(t + \pi)$ . 6
- (b) Find the invariant points of the Bilinear transformation  $w = \left(\frac{4z-9}{z-2}\right)$ , also express it in the normal form. 6
- (c) Obtain Complex form of Fourier series for  $f(x) = \sinh x$  in  $(-l, l)$  8



**Q. P. Code: 23921**

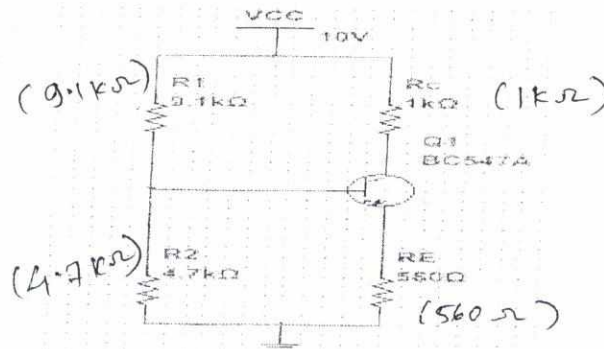
Total Marks: 80

3 Hours

Instructions:

1. Question Number 1 is Compulsory
2. Attempt Any Three from the remaining 5 Questions
3. Figures to right indicate the full marks
4. Assume the suitable data if necessary.

- Que. 1 Answer Any FOUR of the following 20
- a Draw and explain the construction of Junction Field Effect Transistor
  - b Explain the VI characteristic of Schottky Diode and give the applications of it.
  - c Explain in brief the h-parameter model in BJT
  - d What is Darlington configuration? Why is it used in BJT?
  - e A Hartley Oscillator circuit having two individual inductors of  $0.5\text{mH}$  each are designed to resonate in parallel with a variable capacitor used is of  $100\text{pF}$ . Determine the frequency of oscillation
  - f State the advantages of negative feedback
- Que. 2 a State the various types of negative feedback amplifiers and compare these amplifiers in terms of block diagram, feedback gain, bandwidth, Noise, frequency distortion, stability and amplifier type 10
- b Explain the features of multistage RC coupled amplifier. Draw the neat circuit diagram of two stage R-C coupled transistor amplifier and also give its frequency response 10
- Que. 3 a State the Barkhausen's criteria used in oscillators and explain the R-C phase shift oscillator in detail 10
- b Give the comparison between C, LC and CLC and ~~CLC~~ filters that are used in rectifiers. 10
- Que. 4 a State the various biasing techniques used in BJT and calculate the values of  $I_{BQ}$ ,  $I_{CQ}$  and  $V_{CEQ}$  for the following circuit shown of Silicon transistor with  $\beta=100$  10





**Q. P. Code: 23921**

- b Draw and explain D-type MOSFET in detail with its input and output characteristics. 10
- Que. 5 a Give the complete AC analysis of CE amplifier using either h parameter model or re model. 10
- b Differentiate JFET and MOSFET in terms of symbol, construction, Input impedance, biasing methods used and also source and drain characteristics. 10
- Que 6 Write a short note on any two of the following 20
- a UJT relaxation oscillator
- b Thermal stabilization and compensation
- c Concept of DC load Line used in BJT



(15)

SE-EE - CBCS (Choice Based)

Sem-III - CNCPG

Q. P. Code:-23915

[Time: Three Hours]

[Marks:80]

- Note : 1) Question No.1 is compulsory.  
 2) Attempt any 3 questions from remaining five questions.  
 3) Figure to the right indicate full marks.  
 4) Make suitable assumptions wherever necessary.  
 5) Draw suitable diagram wherever necessary

Q 1. Attempt any Four

20

- a) Describe the Load Factor and Plant Capacity Factor.  
 b) State and Explain the selection criteria for Hydro Power Plant.  
 c) Explain Nuclear Fission and Fusion.  
 d) What Factors affect a Runoff data at a particular site?  
 e) Write about the Conventional and Non-Conventional sources of energy.

Q2 a) Explain the Thermal Power Plant in detail with its neat block diagram.

b) Explain Pressurized Water Reactor with its advantages and disadvantages. 20

Q3 a) Explain Operation of Diesel Power Plant with layout.

b) Discuss the role of Super Heater and its impact on the performance of power plant. 20

Q4 a) Explain the performance of Gas Turbine Power Plant.

b) Discuss the broad classification of Hydro Electric Power Plant with figure. 20

Q5 a) Explain Ash handling plant in Steam Power Station.

b) Describe Solar Power Plant. Write short notes on Solar Active and Passive Collectors. 20

Q6 a) Explain operation of PWR Nuclear Reactor with its advantages and disadvantages. 20

b) The maximum demand of a power station is 9600KW. It has to supply the load as follows:-

Time (Hrs)	0-6	6-8	8-12	12-14	14-18	18-22	22-24
Load (MW)	48	60	72	60	84	96	48

1) Draw Load Curve and Load Duration Curve. 2) Calculate Load Factor.

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Q.P. Code: 24378

Time: 3 Hours

Total marks : 80

Note: 1) Question No.1 is compulsory.

2) Attempt any three questions out of remaining five question.

3) Assume suitable data if required.

- Q.1 (a) Differentiate between indicating and integrating instrument. (4)
- (b) Explain resolution and sensitivity of digital meter. (4)
- (c) Explain piezo electric transducer. (4)
- (d) Explain a De Sauty's bridge to measure the capacitance of capacitor. (4)
- (E) Explain resistance temperature detector (RTD). (4)
- Q.2 (A) Explain working principle, construction of moving iron instrument and hence derive the torque equation. (10)
- (b) Describe construction, working principle and theory of dynamometer type wattmeter. (10)
- Q.3 (a) Explain with block diagram Ramp type digital voltmeter. (10)
- (b) Explain Kelvins double bridge to measure low resistance and hence derive the equation for unknown resistance. (10)
- Q.4(a) Explain Maxwell's Inductance bridge to measure self inductance and hence derive the equation for self inductance using above bridge, draw phasor diagram. (10)
- (b) Explain the construction and working of D.C. Crompton type potentiometer. (10)
- Q.5(a) Write down the advantages and disadvantages of Thermistor. Find the material constant  $\beta$  of a NTC thermistor if its resistance at  $108^\circ\text{C}$  is 1.87 kilo-ohm and it increases to 1.37 mega-ohm as the temperature changes to  $-37^\circ\text{C}$ . (10)
- (b) Explain the construction and working of LVDT. (10)
- Q.6 Write a short note on (any three)
- |                            |                           |      |
|----------------------------|---------------------------|------|
| a) PMMC instrument         | b) Megger                 | (20) |
| c) Digital frequency meter | d) Ballistic galvanometer |      |



**Q.P. Code:27110**

Time: 3 Hours

Marks: 80

N.B. 1) Question No. 1 is compulsory

- 2) Attempt any three from the remaining Questions No. 2 to No. 6.
- 3) Illustrate answers with diagrams wherever necessary.

- Q 1. a) Explain the concept of soft starter with the help of neat block diagram. 05
- b) Explain why regenerative braking is not possible in case of DC series motor? 05
- c) Briefly Explain the significance of Back E.M.F. 05
- d) State the various types of stepper motor & list out the different applications. 05
- Q 2. a) Explain the concept of singly excited machines and derive the expression for the electromagnetic torque. 10
- b) Explain the different types of losses in Electro magnetic circuits. Explain the precautions taken to reduce hysteresis loss and eddy current loss. 10
- Q 3. a) Explain with a neat sketch the construction of a DC machine. 10
- b) A 200 V shunt motor having armature resistance of 0.4 Ohm and shunt field resistance of 100 Ohm drives a load at 500 rpm taking 27 A. It is desired to run the motor at 700 rpm. Assuming the load torque to be constant. Find the value of resistance to be used as field regulator. Neglect saturation effect. 10
- Q 4. a) Derive the E.M.F. equation of DC Machine. 10
- b) A 20 HP, 220 V shunt motor takes a full load current of 82 A, speed 1000 rpm, armature resistance 0.1 ohm, shunt field resistance 110 ohm. It is to be braked by plugging. What resistance must be placed in series to limit the current to 120 A? Find also the initial value of the braking torque. 10
- Q 5. a) What is commutation and explain the process of commutation in DC generator. Also mention the methods to improve the commutation process. 10
- b) A field's test on two similar series machine gave the following data: 10
- |            |                         |         |
|------------|-------------------------|---------|
| Motor:     | Armature current        | = 60 A  |
|            | Voltage across armature | = 500 V |
|            | Voltage across field    | = 40 V  |
| Generator: | terminal voltage        | = 450V  |
|            | Output current          | = 46 A  |
|            | Voltage across field    | = 40 V  |
- Armature resistance (Including brushes) of each machine is 0.25 Ohm. Calculate efficiency of both the machines.
- Q 6. a) Explain the term step angle and stepping rate in stepper motor. Also determine the step angle of a variable reluctance stepper motor with 12 teeth in stator and 8 rotor teeth. 10
- b) Explain the construction and working of permanent magnet stepper motor. 10

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Correction in T1233 / T313 / Electrical Machine-I QP Code : 27110 Q.6 a) Please read as E ..



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Correction in T1233 / T313 / Electrical Machine-I QP Code : 27110

Q.6 a) Please read as: Explain the term step angle and stepping rate in stepper motor. Also explain the working of variable reluctance stepper motor in brief.

University of Mumbai

<http://www.uom.ac.in>

[ir@aiktc-krrc.org](mailto:ir@aiktc-krrc.org)

022-26534263 / 022-26534266

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