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Total number of printed pages – 3

B. Tech
PCEC 4201

Third Semester Regular Examination – 2014

ANALOG ELECTRONICS CIRCUITS

**BRANCH(S) : AEIE, BIOMED, CSE, EC, EEE, ELECTRICAL,
ETC, IEE, IT**

QUESTION CODE : H 397

Full Marks – 70

Time – 3 Hours

*Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks*

1. Answer the following questions :

2 × 10

- (a) Write Shockley's equation. How it is used to design d.c biasing of JFET ?
- (b) The voltage gain of an amplifier with negative feedback is 100. If the feedback factor is 40%. Find the voltage without feedback.
- (c) Define CMRR and Slew rate of ideal op-amp.
- (d) Write the difference BJT and FET.
- (e) Show that the dynamic resistance of a diode varies inversely with current.
- (f) Design an RC phase shifter that introduces a phase shift of $\pi/4$ radians.
- (g) What is the linear amplification factor of a transistor if its gain 100 ?
- (h) What are the minimum values of gain in inverting and non-inverting amplifiers ?

P.T.O.

(i) Write the two advantages of a push-pull power amplifier.

(j) Why a fixed bias is called so? Validate.

2. Draw the circuit diagram of a class-A transformer coupled power amplifier using an npn transistor. This amplifier drives a 16 ohms speaker through a 4 : 1 transformer, using a power supply of $V_{CC} = 36$ V, the circuit delivers 2 watts to the load. Calculate 10

(a) as power across transformer primary,

(b) ac voltage across the load,

(c) the rms value of load current.

3. Draw the circuit diagram of a JFET based phase shift oscillator and derive the expression for the condition of oscillation and frequency output. 10

4. (a) Derive an expression for total collector current in CE configuration. 5

b) In a BJT fixed bias circuit $\beta = 150$, $V_{CC} = 10$ V, $R_C = 1$ k Ω , $R_B = 100$ k Ω , $C_{in} = C_{out} = 10$ μ F. Determine the Q-point of the circuit. 5

5. (a) Explain the frequency response of BJT amplifiers. 5

(b) Explain cascade configuration. What is its utility? 5

6. (a) What is instrumentation amplifier? Briefly explain the operation of an instrumentation amplifier using op-amp. 5

(b) An n channel FET has $V_p = -2.0$ V and $I_{DSS} = 1.65$ mA. It is desired to bias the circuit at $I_D = 0.8$ mA at $V_{DD} = 24$ volt. Find V_{GS} , g_m , R_S and R_D 5

7. (a) Establish the even order harmonic cancellation property of a push-pull amplifier mathematically. 5
- (b) What are the advantages of providing negative feedback to an amplifier? 5
8. Write short notes on any two of the following: 5 × 2
- (a) Integrator and differentiator using O.P. amp
- (b) Crystal Oscillator
- (c) D-type MOSFET
- (d) Class-B Power amplifier.

