Total No. of Questions – [5] Total No. of Printed Pages : 4

G.R. No.	

Paper Code :- U17-105A (RE-FF & F)

DECEMBER 2017 / ~~END SEM~~ RE-EXAM

F. Y. B. TECH. (COMMON) (SEMESTER - I)

COURSE NAME: ENGINEERING PHYSICS

COURSE CODE: ES10175A

(2017 PATTERN)

Time: [**2 Hours**] [Max. Marks: **50**]

Instructions to candidates:
1) **Answer Q.1 OR Q.2, Q.3 OR Q.4 and Q.5**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data wherever required**

Q.1) **a)** Explain the construction and working of carbon dioxide laser with the help of energy level diagram. **[6]**

b) Explain : i) Stimulated emission **[6]**
ii) Pumping
iii) Optical cavity

c) Find the relative population of the two states in a He-Ne laser that produces light of wavelength 6328 Å at 300 K and 600 K. Comment on answers obtained at two different temperatures. **[4]**

OR

Q.2) **a)** Enumerate the applications of laser in biomedical field and explain any one in detail. **[6]**

b) Explain the construction and working of single hetero junction diode laser with the suitable energy band diagram. **[6]**

c) The refractive index of core and cladding of an optical fibre are 1.64 and 1.58, respectively. Calculate its numerical aperture and maximum acceptance angle. **[4]**

Q.3) **a)** Derive Schrodinger's time independent equation for a matter wave. **[6]**

b) What is reactor poisoning? How is nuclear fission reaction rate maintained in spite of reactor poisoning? **[4]**

c) When a slow neutron is captured by U^{235} nucleus, fission results in release of 200 MeV energy. If the output power of a nuclear reactor is 1.6 MW, calculate the number of nuclei undergoing fission per second. **[4]**

OR

Q.4) **a)** Explain the building blocks of Nuclear reactor with the help of a diagram. **[6]**

b) Discuss with the help of liquid drop model, why nuclear fission takes place in U^{235}, but not in U^{238}? Also draw an appropriate diagram. **[4]**

c) An infinite potential well has a width of 1 Å. What is the fractional change in the lowest two permissible energies of an electron in this well if the width is increased to 2 Å? (Given: $h = 6.63 \times 10^{-34}$ J-sec, $m = 9.1 \times 10^{-31}$ kg) **[4]**

Q.5) **Attempt following multiple choice questions: [1x20=20 marks]**

a) As the audience increases in a concert hall, the reverberation time [1] _____.

i. remains constant ii. decreases
iii. increases iv. initially increases and then decreases

b) Intensity level corresponding to threshold intensity on dB scale is [1] _____.

i. 1 ii. -12 iii. 0 iv. 12

c) The sound waves that propagate in a metal bar may be _____. **[1]**

i. Longitudinal
ii. Transverse
iii. both longitudinal and transverse
iv. none of the above

d) A sound wave of wavelength 5 cm traveling with a speed of 340 m/s has a time period of _____ **[1]**

i. 0.14 Ms ii. 0.14 s iii. 0.14 μs iv. 0.14 ms

e) Principle of ultrasound echo sounding is used in _____ **[1]**

i. depth sounding ii. cleaning iii. welding iv. drilling

f) For a thin uniform film, the interference pattern by reflection consists of _____. **[1]**

i. Uniform intensity throughout the film
ii. Straight parallel bands of equal width
iii. Straight parallel bands of unequal width
iv. Curved bands

g) The first minimum for a Fraunhofer diffraction from a single slit (width a) occurs at an angle θ with respect to the incident beam (wavelength λ) such that θ = _____ **[1]**

i. $\sin^{-1}(\lambda/a)$ ii. $\sin^{-1}(a/\lambda)$ iii. π iv. π/2

h) For a diffraction grating with a grating element 1.67×10^{-4} cm illuminated by light of wavelength $\lambda = 6328$ Å, the maximum order observed is _____. **[1]**

i. 4 ii. 1 iii. 2 iv. 2.6

i) A wedge shaped film is formed by keeping a separator of thickness t between two glass plates. If a separator is moved away from the angle of wedge, fringes will _____. **[1]**

i. come close to one another ii. move away from one another

iii. remains as it is iv. first comes close and then moves away

j) What should be the thickness of non-reflecting coating on glass if $\mu_{glass} = 1.5$ and $\mu_{film} = 1.25$ and $\lambda = 6000$Å? **[1]**

i. 0.2 μm ii. 0.3 μm iii. 1 μm iv. 0.12 μm

k) Fermi level for n-type semiconductor lies _____ at T= 0K. **[1]**

i. close to valence band ii. close to conduction band

iii. at the center of band gap iv. within valence band

l) Fermi-Dirac function value at room temperature for $E < E_F$ _____ **[1]**

i. $f(E) < 1$ ii. $f(E) > 1$ iii. $f(E) = 1$ iv. $f(E) = 0$

m) Resistance of semiconductor _____ with temperature. **[1]**

i. Increases ii. remains unaffected iii. decreases

iv. none of these.

n) Current in a p-n junction diode _____ for forward biasing. **[1]**

i. decreases exponentially ii. is linear

iii. is unaffected by biasing iv. increases exponentially

o) For a n-type semiconductor if the doping concentration of donor impurity is 1.8×10^{15} /cm^3 and intrinsic charge carriers concentration is 10^{10} /cm^3 at 300K. Then what is the concentration of minority charge carriers? **[1]**

i. 0.55×10^{-5}/cm^3 ii. 0.55×10^{-5}/m^3

iii. 0.56×10^{5}/cm^3 iv. 0.56×10^{5}/m^3

p) When two solar cells are connected in parallel _____ . **[1]**

i. current increases ii. voltage decreases

iii. current decreases iv. voltage increases

q) In a solar cell, due to internal resistance R_s which is in series with load resistance _____ . **[1]**

i. current drops ii. voltage drops

iii. efficiency increases iv. fill factor increases

r) For a solar cell with short circuit current 3.3 A, open circuit Voltage 0.614V and fill factor 75%, what is the maximum power generated? **[1]**

i. 1.52 W ii. 0.152 W iii. 15.2 W iv. 0.0152 W

s) To avoid hot spotting in solar panel _____. **[1]**

i. blocking diode is connected in series to each cell
ii. bypass diode is connected in series to each cell
iii. blocking diode is connected in parallel to each cell
iv. bypass diode is connected in parallel to each cell

t) Find out the maximum wavelength above which silicon is transparent? (Given: Band gap of Silicon = 1.1 eV, $h = 6.63 \times 10^{-34}$ J-sec, $c = 3 \times 10^{8}$ m/s) **[1]**

i. 1125 Å ii. 11250 Å iii. 112.5 Å iv. 112500 Å