Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.TECH (ECE)/SEM-2/MCE-201/2013

2013

PHOTONICS & OPTICAL COMMUNICATION

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

Answer any *seven* questions. 7 × 2 = 14

1. a) What do you mean by Stark splitting ?

   b) What is wavelength routed network ?

   c) What do you mean by amplified spontaneous emission ?

   d) What are the advantages of a four level laser over a three level laser ?

   e) What is the function of an optical detector ?

   f) What is broadcast and select network ?

   g) What do you mean by stimulated emission ?

h) What are the different parameters to choose an optical fibre ?

i) What do you mean by co-pumping and counter-pumping ?

j) What are the limitations of Photonic Packet Switching ?

GROUP – B

Answer any *four* questions. 4 × 14 = 56

2. a) What do you mean by dispersion in optical fibres ? What is the effect of dispersion ? 4

b) What do you mean by dispersion shifted fibres ? 3

c) Find an expression for material dispersion parameter in an optical fibre. 7

3. a) What do you mean by external quantum efficiency of an LED ? Deduce an expression for external quantum efficiency of an LED with neat diagram. 2 + 7

b) The radiative and non-radiative recombination lifetimes of the minority carriers in the active region of a double heterojunction LED are 60 ns and 100 ns respectively. Find the total carrier recombination lifetime, the internal quantum efficiency and the power internally generated within the device when the peak emission wavelength is 0·87 μm at a drive current of 40 mA. 5

4. a) Explain the operation of an avalanche photodiode. 7

b) Explain the structure of an edge emitter LED with clear diagram. 7

5. a) How are optical amplifiers used as loss compensators ? 4

b) Explain the operation of a Raman optical amplifier. 7

c) State the advantages and disadvantages of Raman optical amplifier. 3

6. a) Explain in brief different kinds of tunable filters used in WDM system. 4

b) Explain the use of a Blazed Grating in WDM system. 5

c) In a Blazed Grating it is required to achieve a channel spacing of 10 nm. in the wavelength range of 1500 – 1600 nm with a centre wavelength of 1550 nm. Determine the grating element if the angle of blaze of the grating is 10 degree. Also determine the focal length of the lens used in the system. Assume that the output fibres have spacing of 150 μm. Consider first order diffraction. 5

7. a) What do you mean by Bragg wavelength ? Explain the use of a fibre Bragg grating as add/drop multiplexer.

3 + 3

b) How is improved receiver sensitivity obtained in coherent detection ? 3

c) What do you mean by carrier confinement ? How is carrier confinement obtained in a heterojunction laser ? Explain with clear diagram. 2 + 3