

**GANPAT UNIVERSITY**  
**B.TECH SEM-IV ELECTRICAL ENGINEERING**  
**REGULAR EXAMINATION-APRIL-JUNE 2016**  
**2EE404 ELECTRICAL POWER SYSTEM-I**

TIME:3 HRS

Instruction:

TOTAL MARKS:60

- (1) This Question paper has two sections. Attempt each section in separate answer book.
- (2) Figures on right indicate marks.
- (3) Be precise and to the point in answering the descriptive questions.

## Section-I

- Q-1 (a) Prove that most economical power factor for any power system is independent of original power factor of system. (04)
- (b) Define: Diversity factor, Base load plant. (02)
- (c) A generating station has a maximum demand of 20 MW, a load factor of 60%, a plant capacity factor of 50% and plant use factor of 72%. Find (i) the reserve capacity of the plant (ii) the daily energy produced and (iii) maximum energy that could be produced daily if the plant running as per schedule, when fully loaded. (04)

OR

- Q-1 (a) A 3-phase, 50 Hz, 400 V motor develops 100 H.P., the power factor being 0.75 lagging and efficiency 93%. A bank of capacitors is connected in delta across the supply terminals and power factor raised to 0.95 lagging. Each of the capacitance units is built of 4 similar 100 v capacitors. Determine the capacitance of each capacitor. (04)
- (b) Discuss the significance of load curve and discuss how it differs from Load duration curve. (03)
- (c) Explain- Synchronous condenser as fine range variable power factor improvement device. (03)

- Q-2 (a) Deduce an expression for sag in overhead lines provided supports are at equal levels. (05)
- (b) A medium single phase transmission line 100 km long has the following constants: Resistance/km =  $0.2\Omega/\text{km}$ ; Reactance /km= $0.64\ \Omega/\text{km}$ ; Susceptance/km=  $15 \times 10^{-6}\ \text{mho}$ ; Receiving end voltage = 66kV. Assume localized capacitance method and calculate following when line is delivering 10 MW at 0.8 power factor lagging. (i) Sending end voltage and current (ii) % regulation (iii) line losses. (05)

OR

- Q-2 (a) In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self-capacitance of each insulator, find (i) the distribution of voltage over 3 insulators and (ii) string efficiency. (04)
- (b) Discuss three part form of generation cost of electrical energy and explain the factors on which a, b and c constant depend. (03)
- (c) Deduce ABCD parameters for short transmission line. (03)

- Q-3 **Attempt any two.** (10)
- (a) What do you mean by Ferranti effect? Explain reason for its existence by using the phasor diagram.
  - (b) Enlist various methods for medium transmission line analysis and discuss any one.
  - (c) Explain shrinking fund methods for depreciation calculation in economics of generation.

**Section-II**

- Q-4 (a) Discuss the advantages of high transmission voltage. (03)
- (b) State and prove Kelvin's law for size of conductor for transmission. (04)
- (c) A single phase line has two parallel conductors 2 metres apart. The diameter of each conductor is 1.2 cm. Calculate the loop inductance per km of the line. (03)

**OR**

- Q-4 (a) A single phase a.c system supplies a load of 800 kW and if this system is converted to 3-phase, 3-wire a.c system by running a third similar conductor, calculate the 3-phase load that can now be supplied if the voltage between the conductors is the same. Assume the power factor and transmission efficiency to be the same in the two cases. (05)
- (b) Derive an expression for the capacitance of a single phase overhead transmission line. (05)

- Q-5 (a) Explain various methods of improving string efficiency. (05)
- (b) A 132 kV transmission line has the following data : (05)
- Weight of conductor = 680 kg/km, Length of span = 260 m, Ultimate strength = 3100 kg, Safety factor = 2. Calculate the height above ground at which the conductor should be supported. Ground clearance required is 10 metres.

**OR**

- Q-5 (a) Define terms: danger plate, damper, earthed wire. (03)
- (b) Enlist various types of insulators and discuss any one. (04)
- (c) Write a short note on Skin effect. (03)

- Q-6 **Attempt any two.** (10)
- (a) Obtain the equation of Sag for transmission line having equal height supports.
  - (b) What are the advantages and disadvantages of d.c transmission over a.c transmission?
  - (c) Obtain the equation of inductance for three phase transmission line and discuss effect of transposition on transmission line.

-----END OF PAPER-----