Registration No : | | | | | | | | | | |

Total Number of Pages : 03 **B.Tech**

PEL5G001

5th Semester Regular Examination 2017-18
Electrical Machine-I
BRANCH: EEE
Time: 3 Hours
Max Marks: 100
Q.CODE: B400

Answer Question No.1 and 2 which are compulsory and any four from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions: *multiple type or dash fill up type*** **(2 x 10)**

a) The mmf of a single coil armature winding in the air gap of a DC machine is in the form of (a) rectangular (b) trapezoidal (c) sinusoidal (d) triangular

b) The whole dynamics of an electro-magnetic mechanical device in the can be expressed in form of (a) Faraday's Laws of electromagnetic induction (b) Guass's law (c) Ampere's law (d) Maxwell's Law

c) Field control of DC shunt motor gives (a) constant torque drive (b) constant KW drive (c) constant speed drive (d) variable load- speed drive

d) In Hopkinson's test (a) iron loss in both machines are equal (b)iron loss in motoring machines is more than in generating machine (c)iron loss in generating machine is more than in motoring machine (d) only stray load iron loss is equal in both machine.

e) The process of current commutation in a dc machine is opposed by the (a)emf induced in the commutating coil because of the inter-pole flux,

(b) reactance emf (c)coil resistance (d) brush resistance

f) In a synchronous machine, the induced emf phasor (a) leads the flux phasor by 90^0 (b) is in phase with flux phasor (c) lags behind the flux phasor by 90^0 (d) is in phase opposition to the flux phasor.

g) Potier's method uses OCC and ZPFC to yield information about (a) synchronous reactance (b) leakage reactance only (c) field current equivalent of armature reaction only (d) leakage reactance and field current equivalent of armature reaction.

h) A synchronous motor is operated from a bus voltage of 1.0 p.u. and is drawing 1.0 p.u. zero power factor leading current. Its synchronous reactance is 0.5 p.u. The excitation emf of the motor will be

2.0 (b)1.5 (c) 1.0 (d) 0.5

i) The maximum electrical power output of a synchronous generator is (usual symbols are used) (a) $\frac{V_t E_f}{X_s}$ (b) $\frac{V_t^2}{X_s}$ (c) $\frac{E_f^2}{X_s}$ (d) $\frac{X_s}{V_t E_f}$

j) Hunting in synchronous machines occur due to (a) sudden change in load (b) sudden change in field current (c) presence of harmonic variations in the load (d) all of the reason mentioned

Q2 **Answer the following questions: *Short answer type*** **(2 x 10)**

a) Why three phase alternator and motor are called as synchronous machines ?

b) A 4-pole dc motor draws 25 A when it is wave wound. Determine the armature current for a lap-wound motor delivering the same torque.

c) Inverted v curves are the result of relationship between which two parameters?

d) Why armature of synchronous machines are usually done as star connection.

e) What is short circuit ratio(SCR)?

f) Why the nature of the distributed coil of dc machine armature mmf is saddle shaped in the interpole region.

g) Why chamfering of pole tips of DC machine is done ?

h) What is field flashing ?

i) In a differential compounded motor, speed increases when load increases,Why?

j) Draw the flow chart for the power flow in DC generator as well as dc motor.

Part – B (Answer any four questions)

Q3 **a)** Draw and explain the neat circuit for a Ward-Leonard method of speed control of a dc separately excited motor and plot the torque speed characteristic. Write down its advantages and disadvantages. **(10)**

b) A 600V dc motor drives a 60 KW load at 900 rpm. The shunt field resistance is 100 ohm and the armature resistance is 0.16 ohm. If the motor efficiency is 85%, determine **(5)**

the speed at no-load and the speed regulation.

(b) the rotational loss.

Q4 **a)** Why parallel operation is required for the DC generators and what are the desirable condition for parallel operation. Draw the circuit and explain the parallel operation of two compound generators. **(10)**

b) What is stalling current? Draw the torque-speed characteristics showing the stalling torque by adding external resistances at various steps in series with armature circuit of a dc shunt motor. **(5)**

Q5 **a)** Write down the principle of operation of an alternator. Derive the emf equations. Draw the phasor diagram of lagging, leading and unity power factor load of an alternator for showing the operation. **(10)**

b) The test data obtained at the rated speed on a three-phase, Y-connected, synchronous generator are given as follows: **(5)**

Short-circuit test: Field current = 1.2 A, short circuit current = 25 A

Open-circuit test: Field current = 1.2 A, open circuit voltage = 440 V

The per-phase winding resistance is 1.2 ohm. Determine the synchronous impedance of the generator.

Q6 **a)** Derive the emf equation of DC generator. A long-shunt, compound generator delivers a load current of 50 A at 500 V and the resistance of armature, series field and shunt field are 0.05 ohm, 0.05 ohm and 250 ohm respectively. Calculate the generated emf and the armature current. Allow 1.0 V per brush for contact drop. **(10)**

b) What are the various reasons that the generator fails to build up the voltage ? **(5)**

Q7 **a)** What is armature reaction? How this reaction affects to the machine and how to overcome? With the neat diagram, find the demagnetizing and cross magnetizing amperes turns. **(10)**

b) A 20-hp, 440-V series motor is 87% efficient when it delivers the rated load at 900 rpm. The armature-circuit resistance is 0.3 ohm and the series field resistance is 0.2 ohm. If an external resistance of 2.5 ohm is inserted in the armature circuit and the load is reduced by 20%, determine the motor speed. Assume that the motor operates in the linear region. **(5)**

Q8 **a)** A three phase 10 KVA, 400V.4 pole, 50 Hz star connected synchronous machine has synchronous reactance of 16 ohm and negligible resistance. The machine is operating as generator on 400 v bus bars (assumed infinity). Determine the **(10)**

(a) excitation emf (phase) and torque angle when the machine is delivering rated KVA at 0.8 pf lagging.

(b)While supplying the same real power as in part (a), the excitation is raised by 20%. Find the stator current, power factor and torque angle.

b) Write short notes on Blondel's two reaction theory. **(5)**

Q9 **a)** With neat circuit diagram and necessary characteristics, explain the various methods for speed control of a separately excited DC motor. Bring out the advantages and dis advantages of each method. **(10)**

b) Write short notes on load characteristics of dc shunt generator. **(5)**